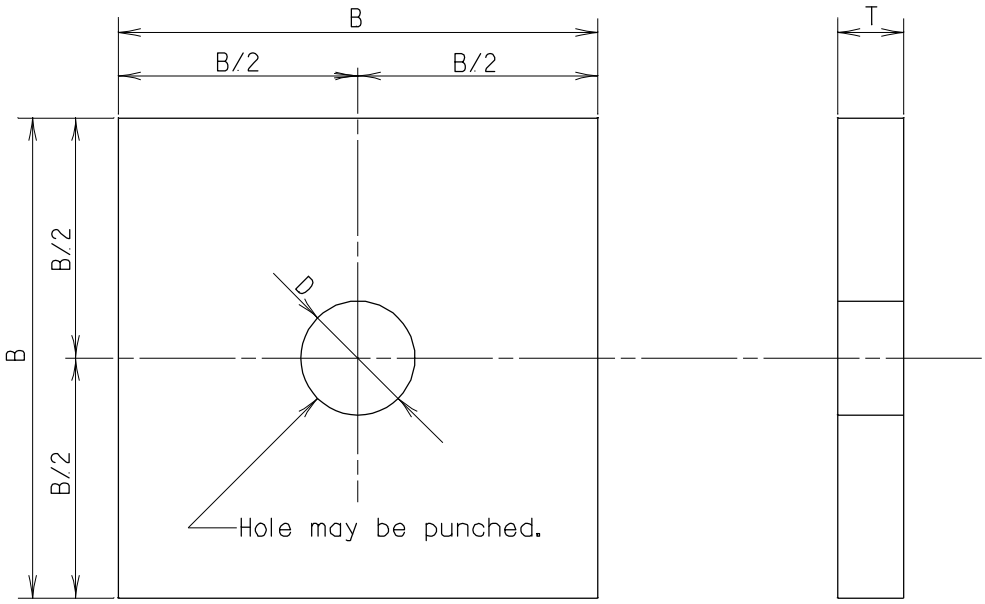


PLAN
Scale: None

END VIEW
Scale: None

BOLT Φ	B	T	D
1 1/4''	5 1/2''	3/4''	1 5/16''
1 1/8''	5''	11/16''	1 3/16''
1''	4 1/2''	5/8''	1 1/16''
7/8''	4''	9/16''	15/16''
3/4''	3 1/2''	1/2''	13/16''
5/8''	3''	3/8''	11/16''
1/2''	2 1/4''	5/16''	9/16''

Note:
All plate washers to be galvanized.

APPROVAL
E.S. Friedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 6/20/75

REVISIONS	
SHA	FHWA

FHWA APPROVAL
DATE: 11-9-76

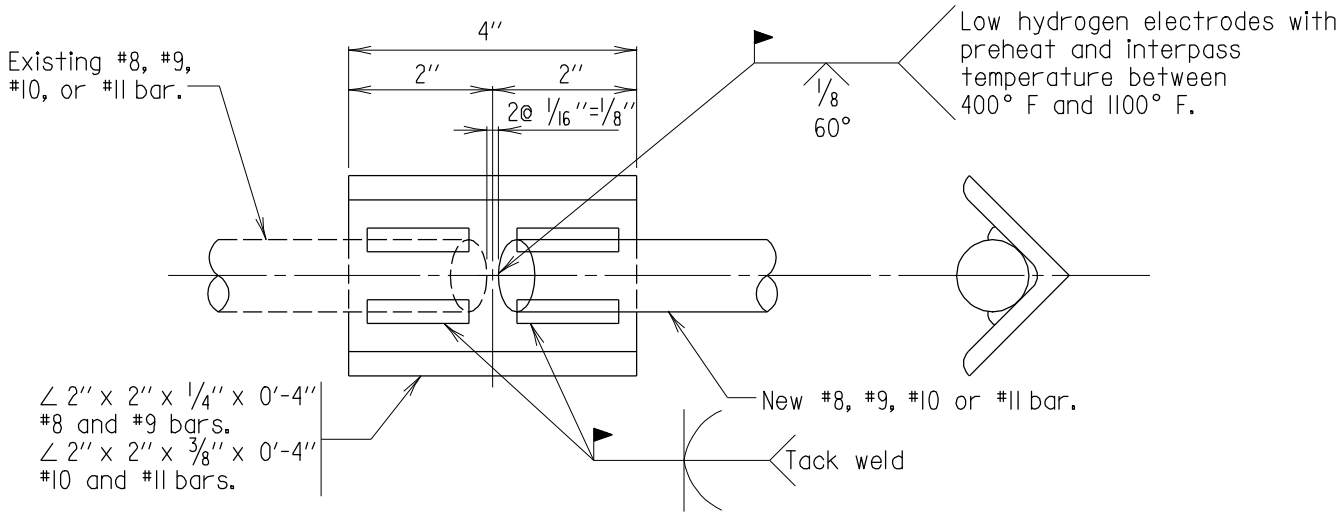
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

STEEL PLATE WASHER DETAILS

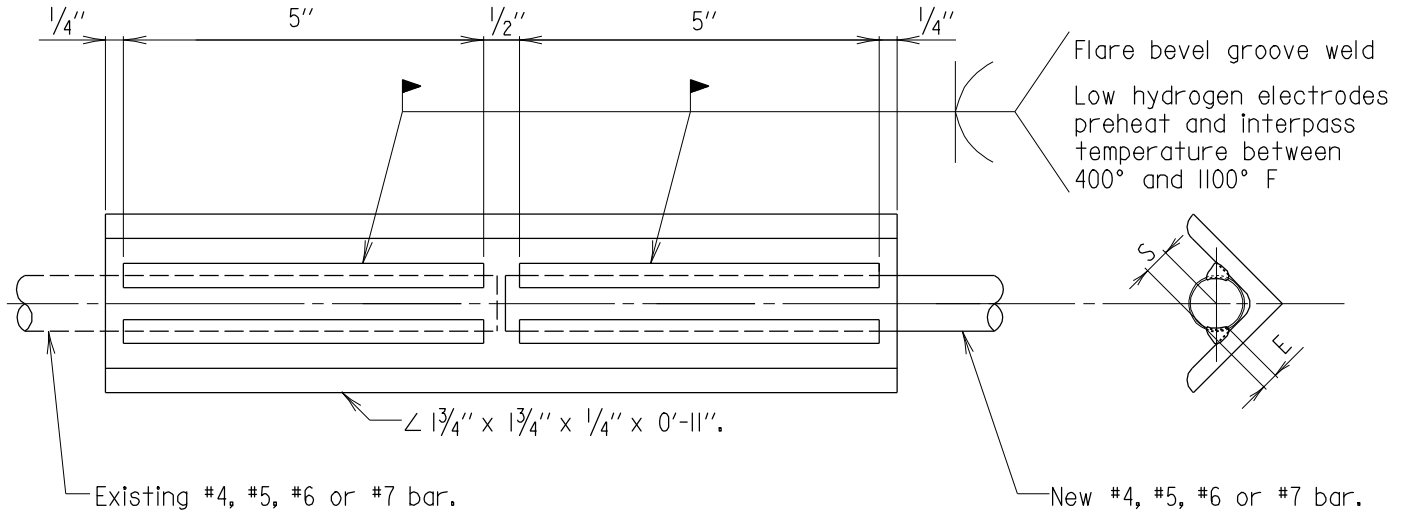
STANDARD NO. M(0.01)-75-8

SHEET 1 OF 1

MISCELLANEOUS



DETAIL FOR WELD SPLICE
FOR #8, #9, #10 OR #11 BARS
Scale: 3/8'' = 1''



DETAIL FOR WELD SPLICE
FOR #4, #5, #6 OR #7 BARS
Scale: 3/8'' = 1''

E = Effective throat weld

E = .4S

S = Radius rebar

Notes:
1. All welding to be in conformance with ANSI/AWS-latest addition.
2. Prequalification required in conformance with ANSI/AWS-latest addition.
3. Angles shall be made of ASTM A 709 Grade 36 or AISI1010, 1015 or 1020 steel.
4. E7018 electrodes shall be used in making the above welded splices.
5. If sufficient bar lap is not available when existing reinforcing steel is exposed, this detail to extend bars shall be used. Cost of these connections shall be included in contract prices bid on pertinent concrete items.
6. Welded splices shall not be used in decks.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/18/76

REVISIONS	
SHA	FHWA
9-24-96	·
8-7-98	·
1-22-01	·
11-26-07	·

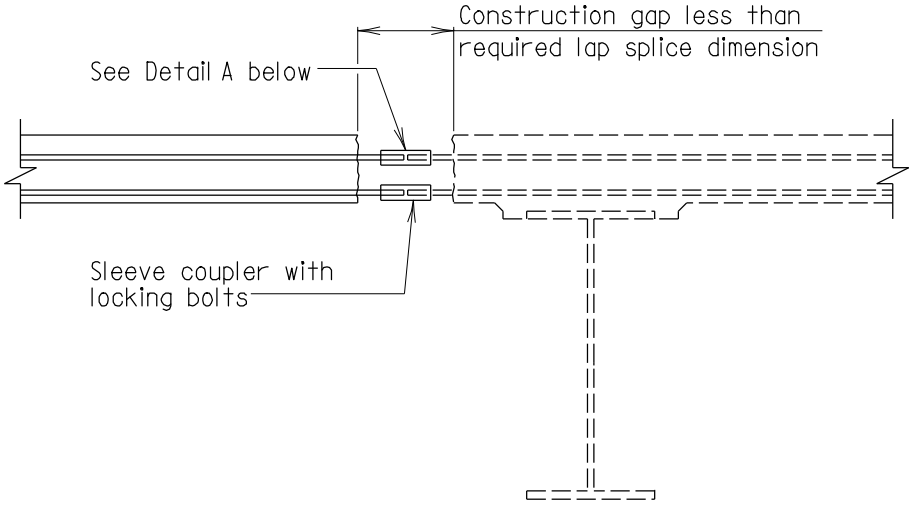
FHWA APPROVAL
DATE: 11-9-76

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

SPLICING TO EXISTING REINFORCING STEEL
WELDED SPLICE

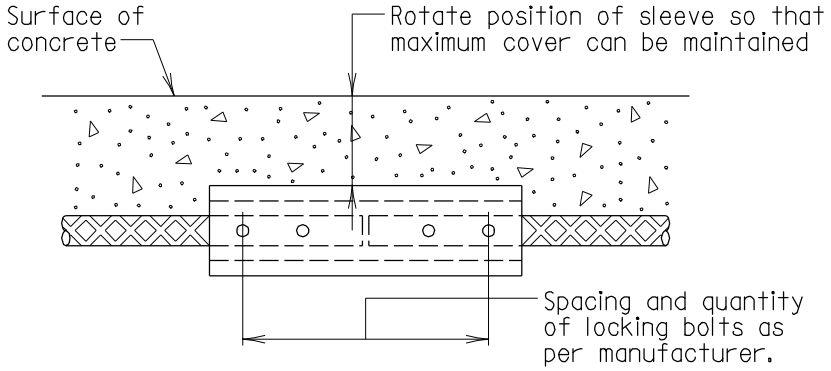
STANDARD NO. M(6.01)-75-12 SHEET 1 OF 2

MISCELLANEOUS



SECTION THROUGH SLAB

Scale: 1" = 1'-0"



DETAIL A

Scale: 3" = 1'-0"

Notes:

1. The coupler must develop a minimum of 125% of the specified yield strength of the reinforcing bar being spliced.
2. Couplers used to connect epoxy coated reinforcing bars must be epoxy coated.
3. The uncoated surface of the sheared off indicator bolt must be covered with epoxy prepared from an approved epoxy touchup kit.
4. Longitudinal deck reinforcing steel is not shown.
5. Existing slab shown dashed.
6. These couplers will not be measured for payment, but all costs thereof shall be included in the Contract lump sum price for the pertinent Reinforcing Steel items.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 8/7/98

REVISIONS	
SHA	FHWA
.	.
.	.
.	.
.	.

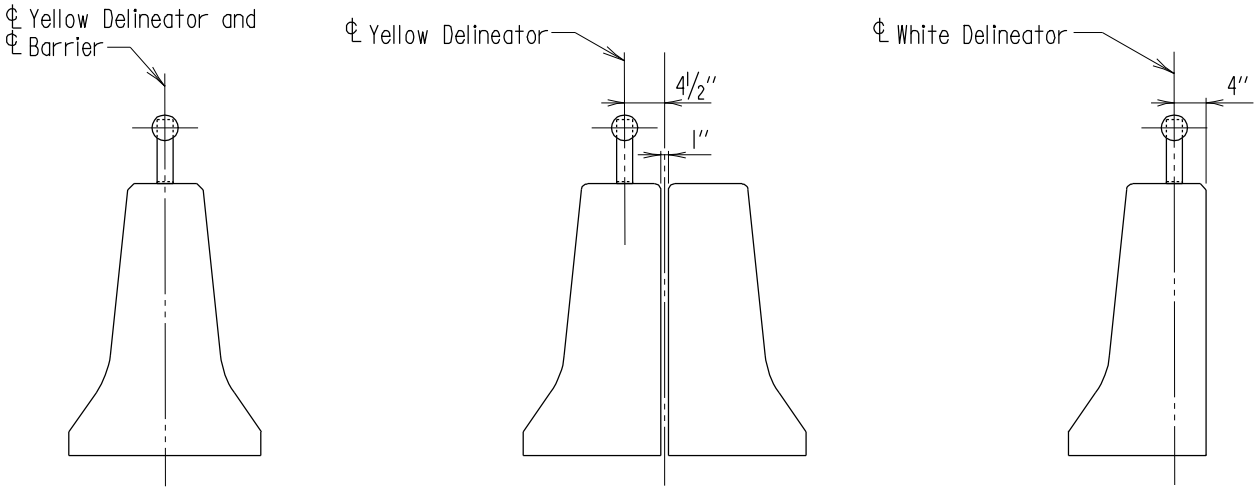
FHWA APPROVAL
DATE: .

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

SPLICING TO EXISTING REINFORCING STEEL
MECHANICAL SPLICE

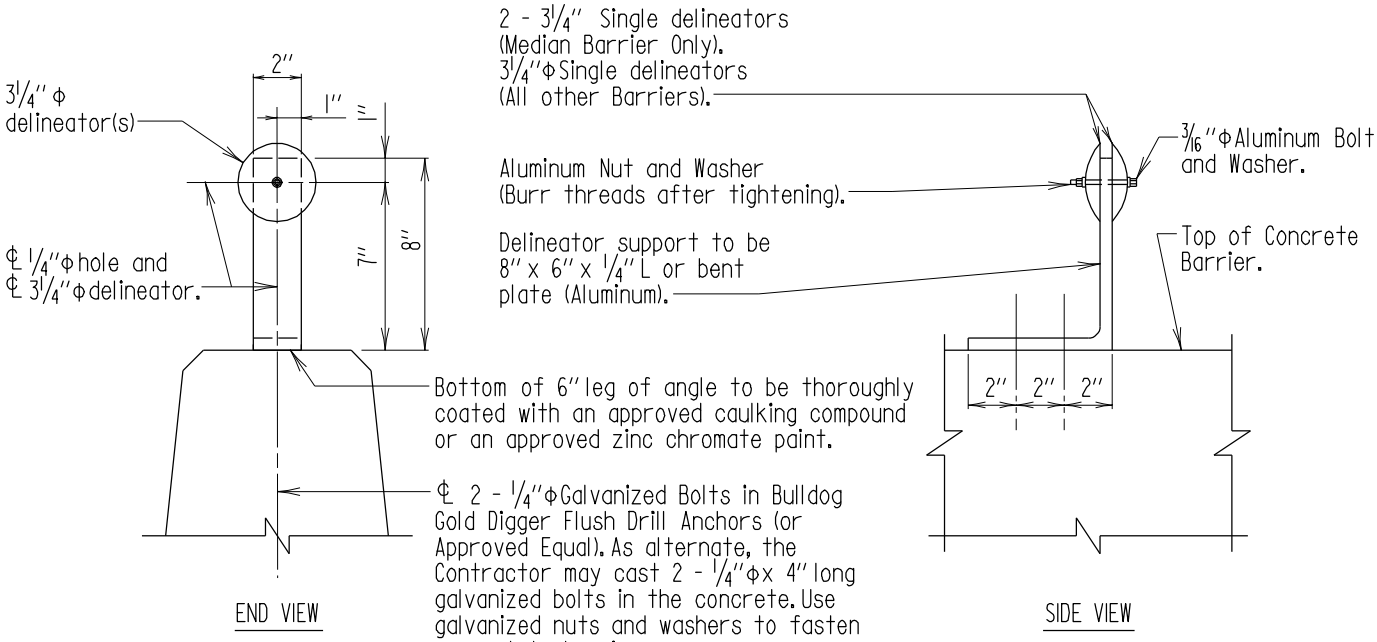
STANDARD NO. M(6.01)-75-12 SHEET 2 OF 2

MISCELLANEOUS



TRANSVERSE LOCATION OF DELINEATORS

Scale: ½" = 1'-0"



CONCRETE BARRIER DELINEATOR

Scale: 1½" = 1'-0"

* SPACING OF DELINEATORS	
Radius of Horizontal Curve	C/C Distance Between Delineators
Less than 2000'	115'
2000' to 3000'	130'
3000' to 5000'	160'
Over 5000'	200'
Tangent Area	200'

* Place one delineator at each end of each wall, even if wall is shorter than lengths indicated below.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 6/20/75

REVISIONS	
SHA	FHWA
10-19-77	10-19-77
6-10-80	7-29-80
10-22-03	·
·	·

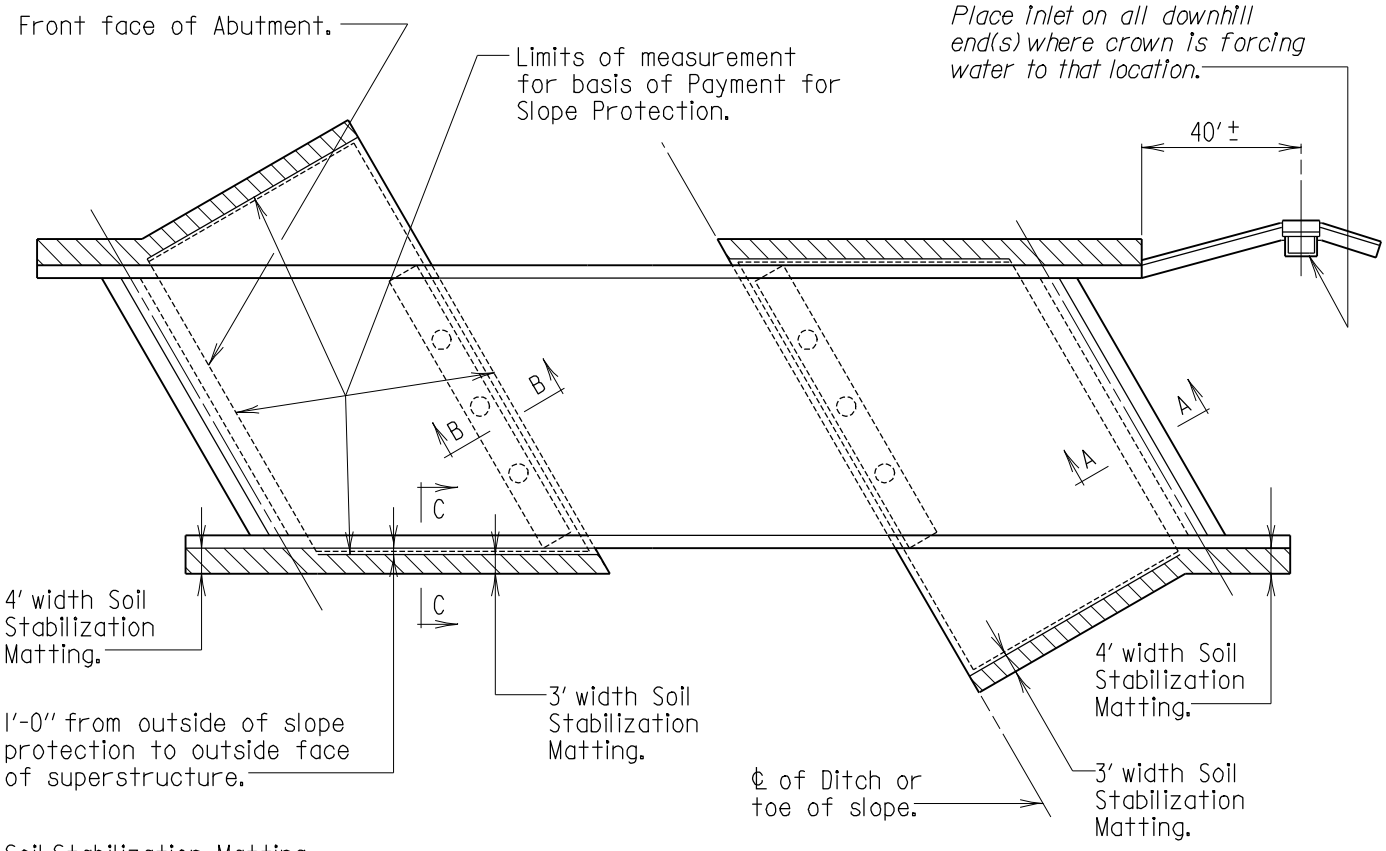
FHWA APPROVAL
DATE: 8-24-76

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

CONCRETE BARRIER DELINEATOR

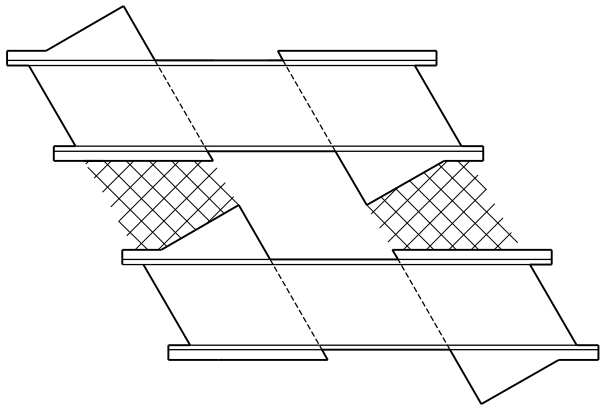
STANDARD NO. M(5.11)-75-14 SHEET 1 OF 1

MISCELLANEOUS



PLAN

Scale: None



SKETCH-PLAN

Note:
On dual bridges where perpendicular distance between bridge faces is less than 30′ or on skewed dual bridges if where the unprotected area for both ends of the bridges (hatched areas ▨ in sketch-Plan) were added is less than 200 s.y.,then slope protection is to be continuous thru median area.

Notes:
1. For Sections A-A, B-B, and C-C see sheets 2 thru 6 of 6.
2. If limits for slope protection are shown on Contract Drawings, then those limits take precedent over what is shown on this sheet.

Slanted lettering indicate notes "For Office Use Only".

APPROVAL
E.S. Friedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/15/78

REVISIONS	
SHA	FHWA
8-3-81	8-20-81
9-25-81	11-25-85
3-21-89	6-8-90
11-15-95	·

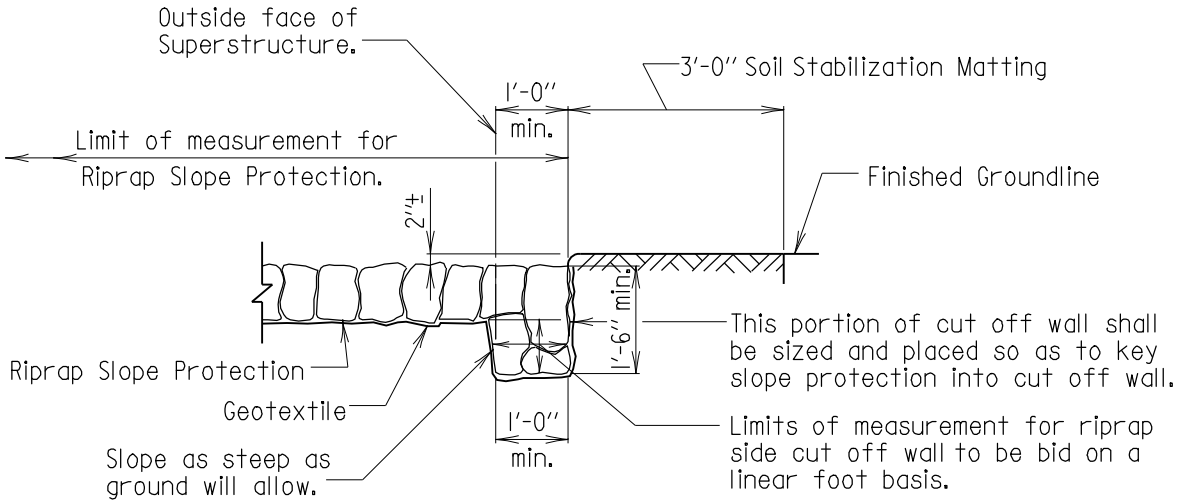
FHWA APPROVAL
DATE: 10-17-78

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

SLOPE PROTECTION FOR BRIDGES CARRYING ROAD OVER ROAD OR RAILROADS

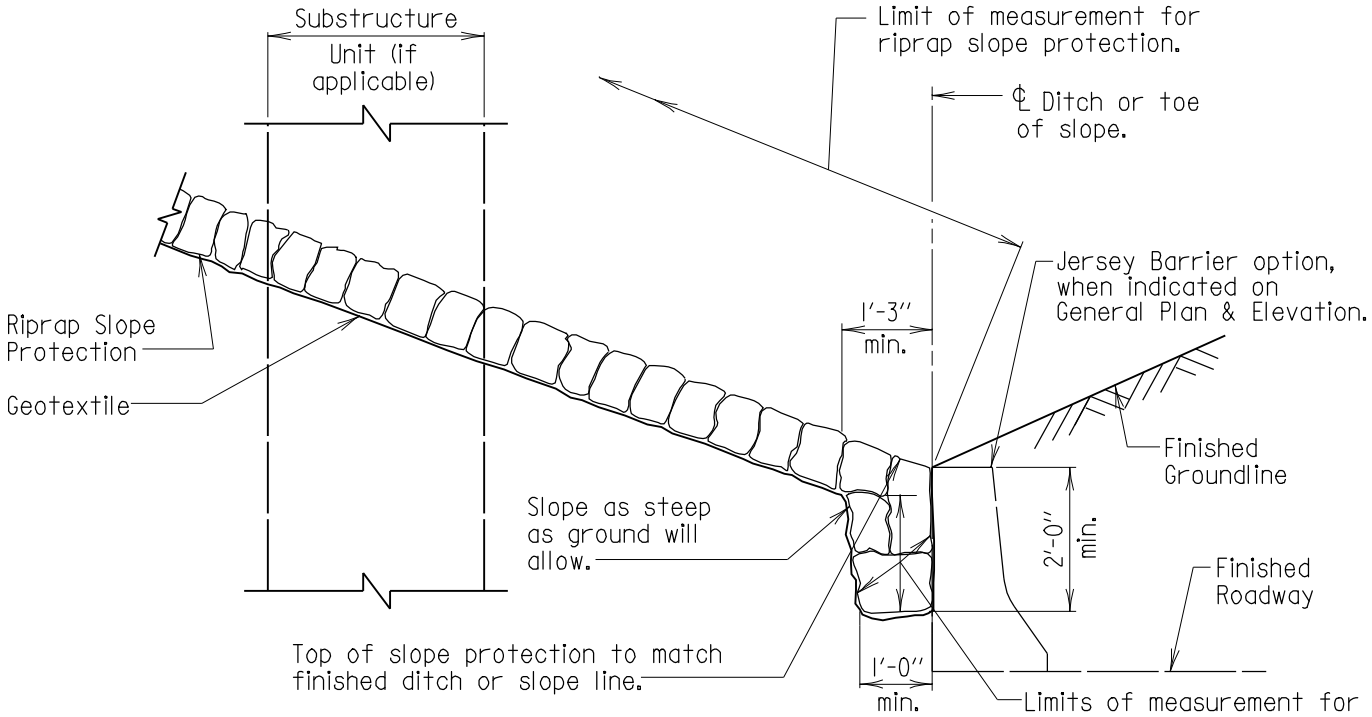
STANDARD NO. M(6.02)-78-75 SHEET 1 OF 6

MISCELLANEOUS



SECTION C-C THRU SIDE OF CUTOFF WALL

Scale: 3/8"=1'-0"



SECTION B-B THRU BOTTOM CUTOFF WALL

Scale: 3/8"=1'-0"

Note:
If a barrier configuration is used at bottom of slope, the bottom cut off wall shall be eliminated.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 12/2/81

REVISIONS	
SHA	FHWA
3-15-90	6-8-90
11-15-95	·
1-22-01	·
6-29-05	·

FHWA APPROVAL
DATE: 11-29-85

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

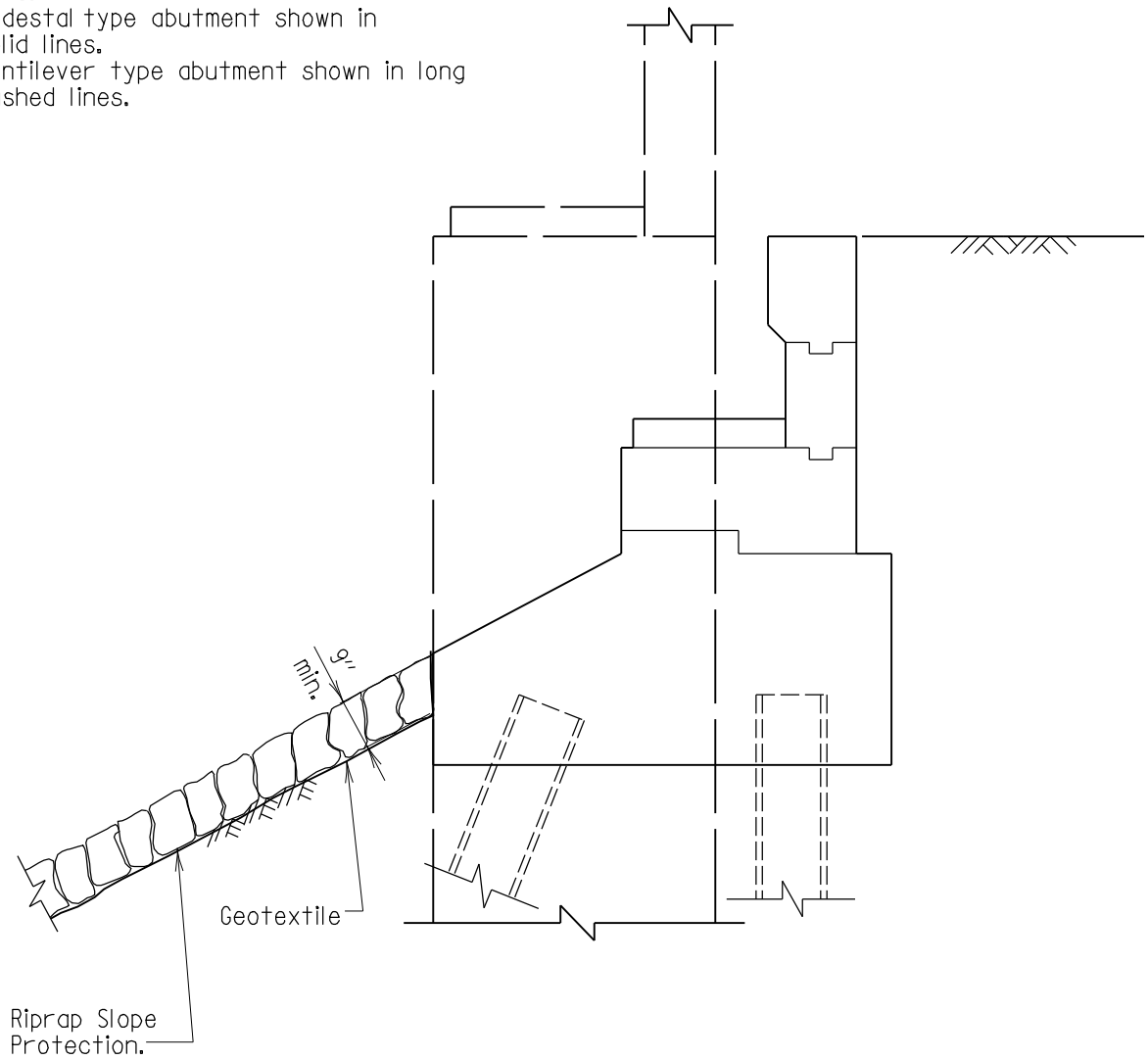
RIPRAP SLOPE PROTECTION FOR BRIDGES CARRYING ROAD OVER ROAD OR RAILROAD

STANDARD NO. M(6.02)-78-75

SHEET 2 OF 6

MISCELLANEOUS

Note:
Pedestal type abutment shown in solid lines.
Cantilever type abutment shown in long dashed lines.



SECTION A-A THRU ABUTMENT
Scale: 3/8" = 1'-0"

Notes:
1. Bottom cut off wall may be eliminated if slope protection can be founded in rock.
2. All material for riprap slope protection shall be Class 1 conforming to 901.02.
3. Refer to Section 311 for other requirements.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 3/21/89

REVISIONS	
SHA	FHWA
1-4-94	·
11-15-95	·
1-22-01	·
7-26-06	·

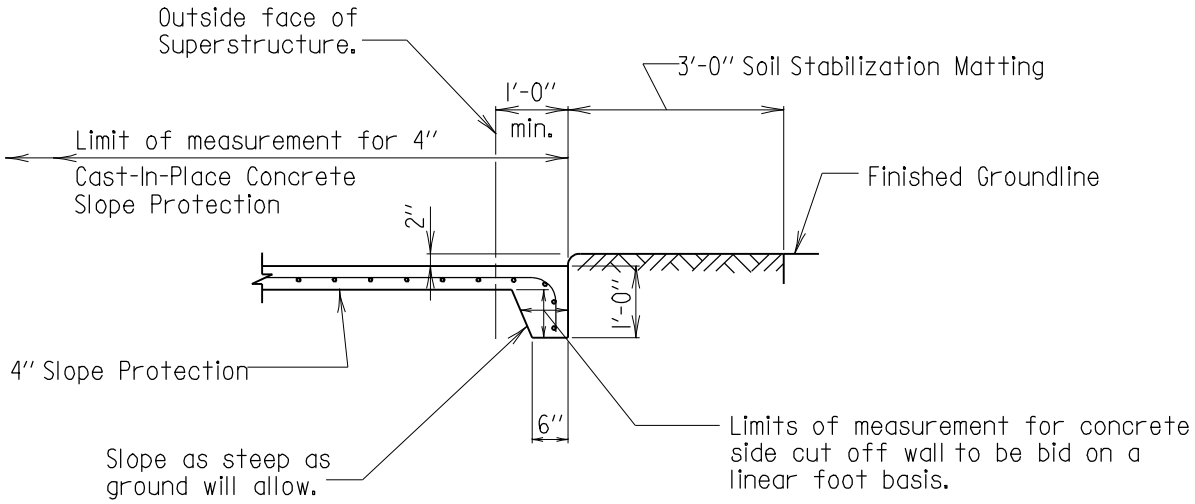
FHWA APPROVAL
DATE: 6-8-90

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

RIPRAP SLOPE PROTECTION FOR BRIDGES CARRYING ROAD OVER ROAD OR RAILROAD

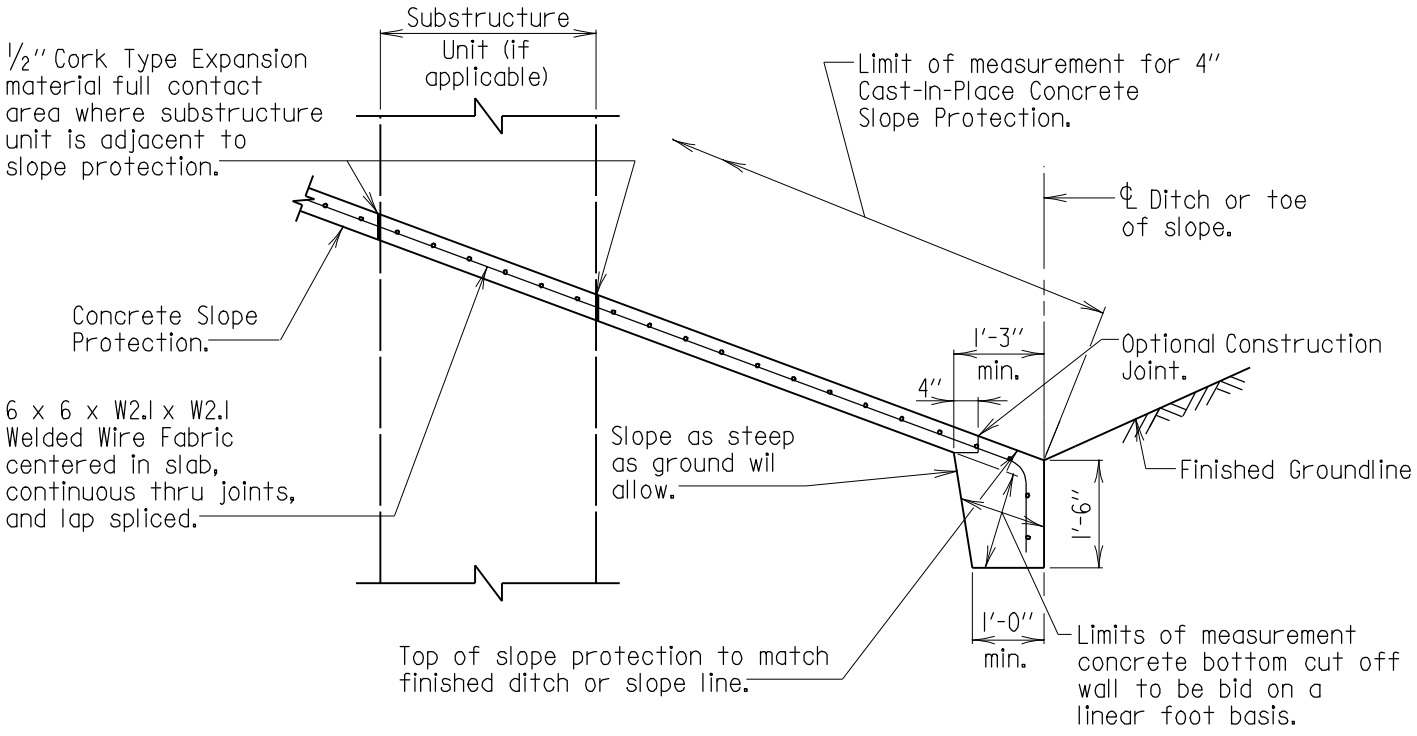
STANDARD NO. M(6.02)-78-75 SHEET 3 OF 6

MISCELLANEOUS



SECTION C-C THRU SIDE OF CUTOFF WALL

Scale: 3/8"=1'-0"



SECTION B-B BOTTOM OF CUTOFF WALL

Scale: 3/8"=1'-0"

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/12/78

REVISIONS	
SHA	FHWA
2-17-87	6-8-90
3-21-89	6-8-90
11-15-95	·
1-22-01	·

FHWA APPROVAL
DATE: 10-17-78

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

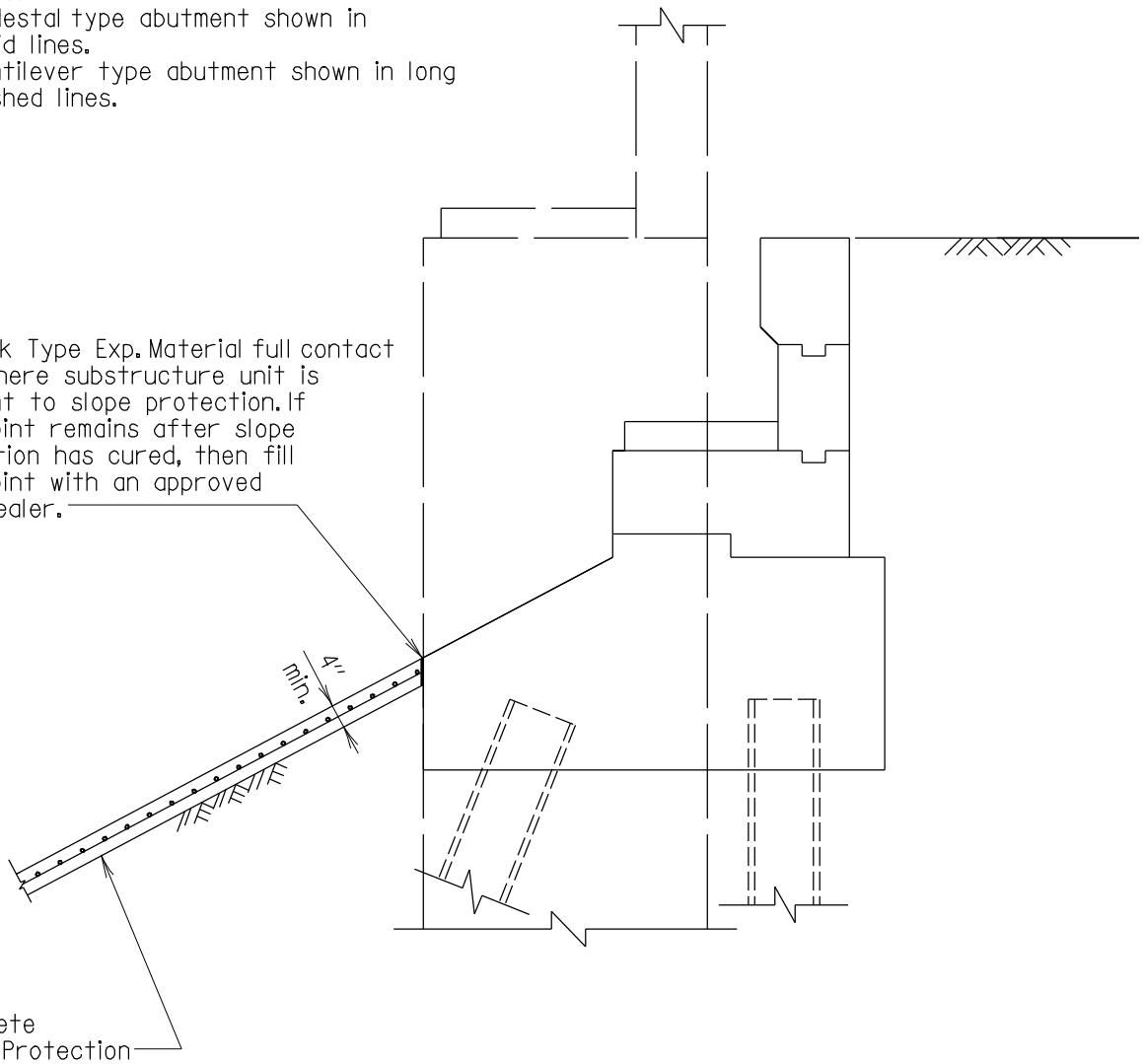
CONCRETE SLOPE PROTECTION FOR BRIDGES CARRYING ROAD OVER ROAD OR RAILROAD

STANDARD NO. M(6.02)-78-75

SHEET 4 OF 6

MISCELLANEOUS

Note:
Pedestal type abutment shown in solid lines.
Cantilever type abutment shown in long dashed lines.



SECTION A-A THRU ABUTMENT
Scale: ⅜" = 1'-0"

Notes:
1. Bottom cut off wall may be eliminated if slope protection can be founded in rock.
2. Refer to Section 310 for other requirements.

APPROVAL
E.S. Friedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 3/21/89

REVISIONS	
SHA	FHWA
2-22-00	·
4-17-00	·
1-22-01	·
7-26-06	·

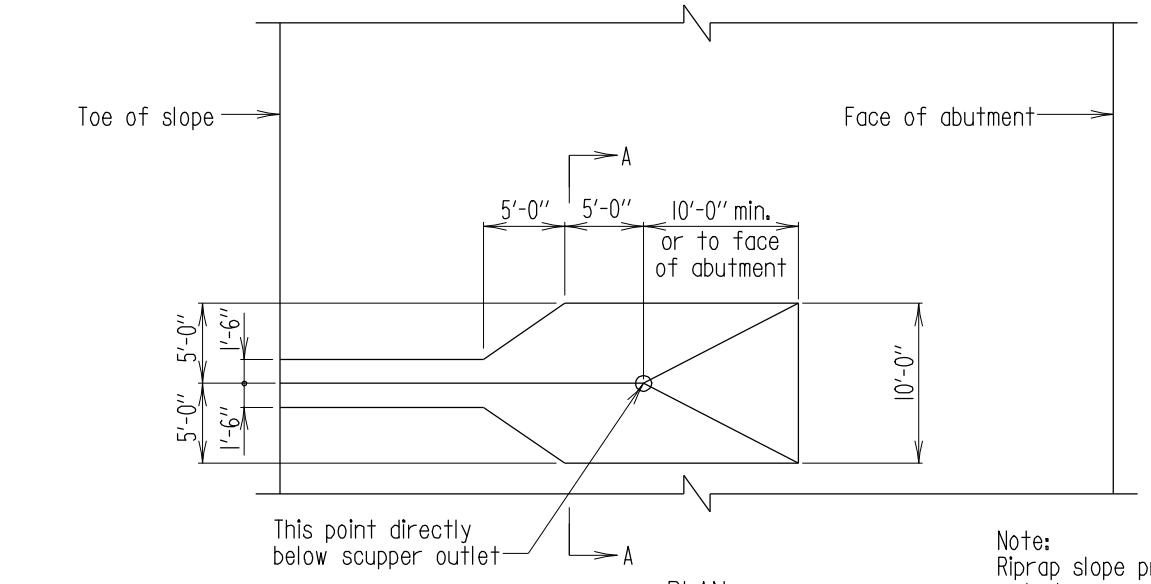
FHWA APPROVAL
DATE: 6-8-90

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

CONCRETE SLOPE PROTECTION FOR BRIDGES CARRYING ROAD OVER ROAD OR RAILROAD

STANDARD NO. M(6.02)-78-75 SHEET 5 OF 6

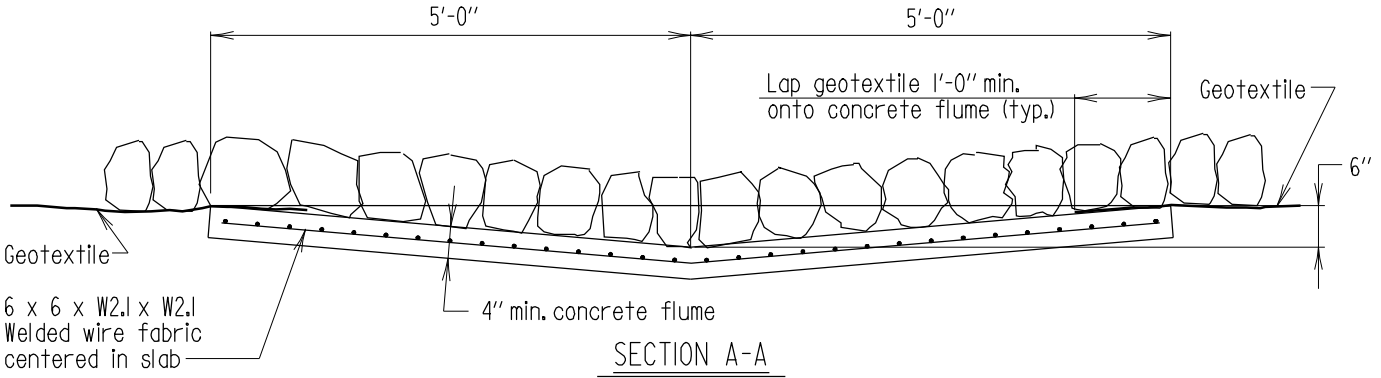
MISCELLANEOUS



Note:
Riprap slope protection
not shown.

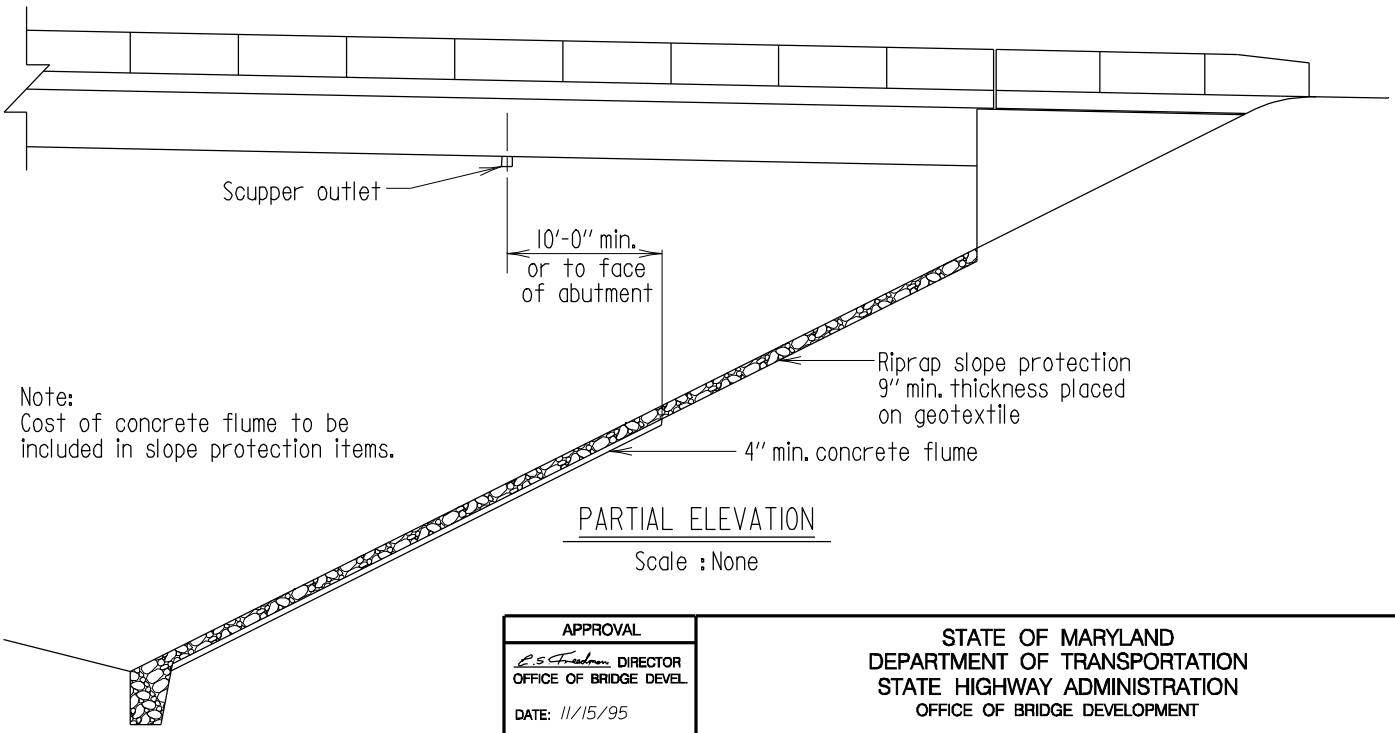
PLAN

Scale : None



SECTION A-A

Scale : 1/2" = 1'-0"



Note:
Cost of concrete flume to be
included in slope protection items.

PARTIAL ELEVATION

Scale : None

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 11/15/95

REVISIONS	
SHA	FHWA
11-15-95	·
·	·
·	·
·	·

FHWA APPROVAL		
DATE:	·	·

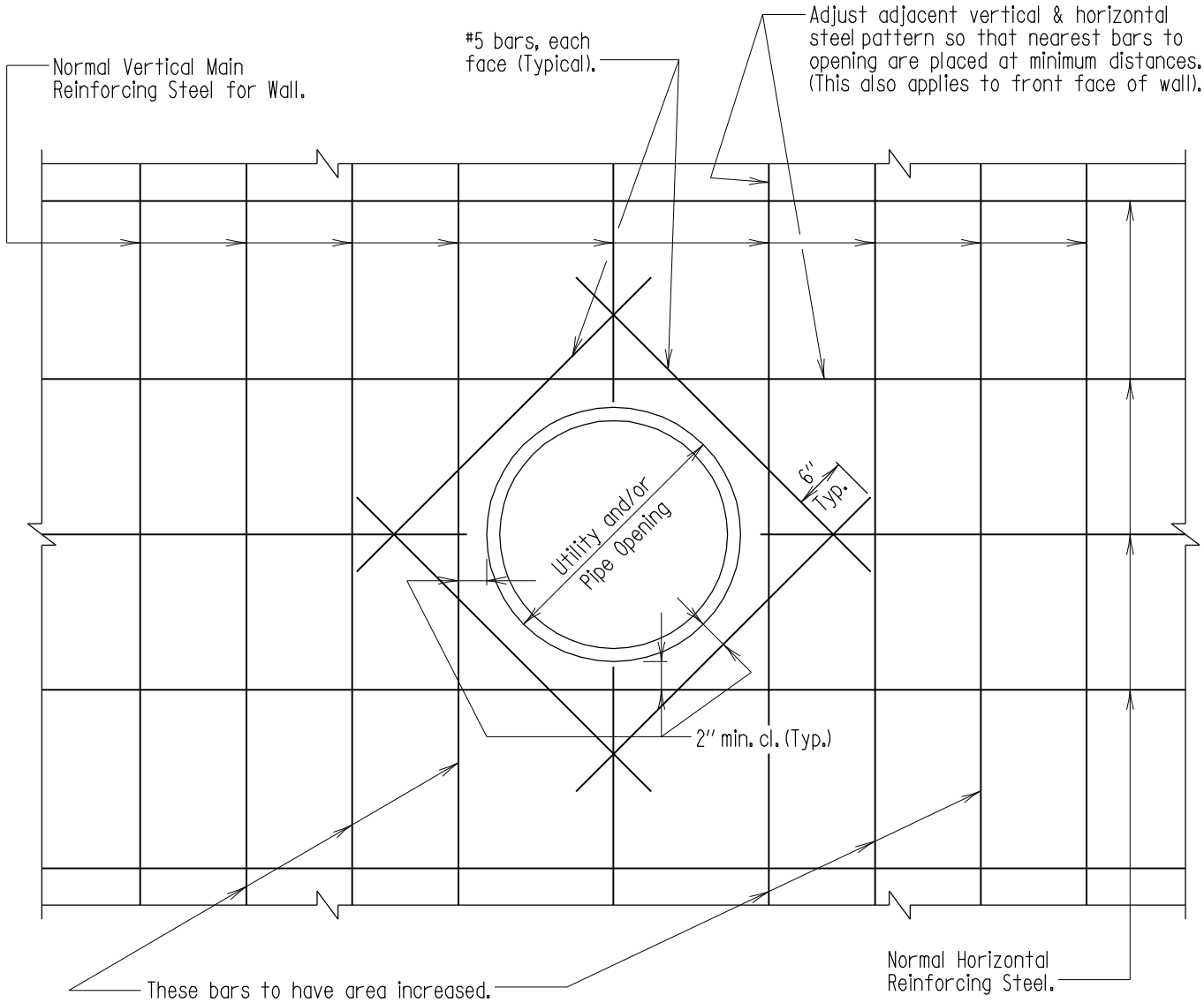
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

CONCRETE SPLASH BLOCK ON END SLOPE WITH RIPRAP SLOPE PROTECTION

STANDARD NO. M(6.02)-78-75

SHEET 6 OF 6

MISCELLANEOUS



ELEVATION
Scale: None

Note:
1. Increase the size of each of the first three normal main vertical reinforcing steel bars, on each side of the wall opening. New bar size shall be such that each increase in bar area shall at least equal 1/6 the total area of the main reinforcing steel that has been cut.
2. When pipe size is over 3'-0", sufficient horizontal bars shall be addded over and below opening to transfer load to adjacent full sections of wall.
3. In no case shall concrete cover be less than 2".

FOR OFFICE USE ONLY

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 7/26/79

REVISIONS	
SHA	FHWA
12-4-84	6-8-90
7-2-93	·
·	·
·	·

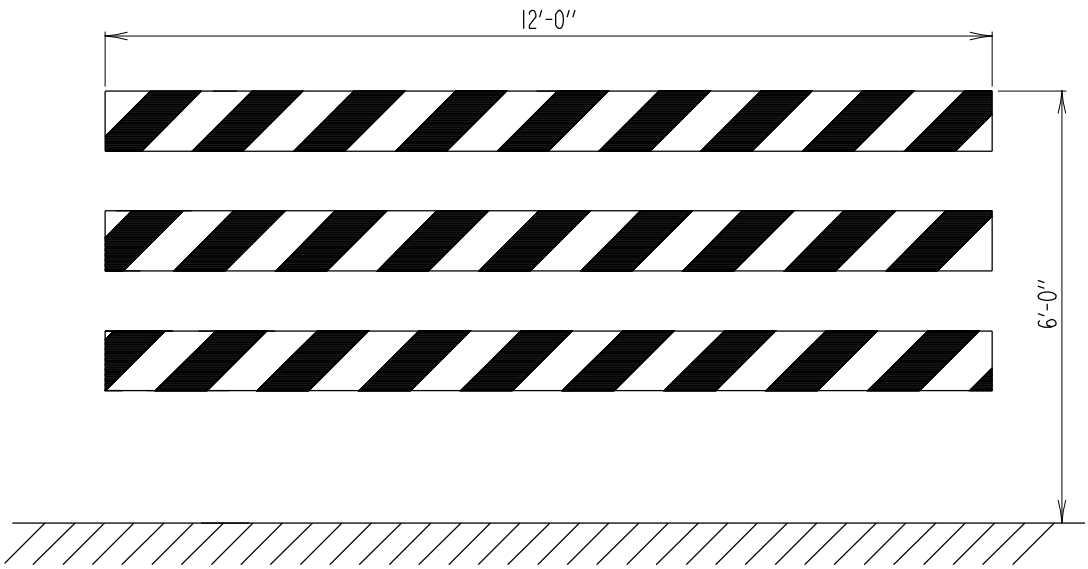
FHWA APPROVAL
DATE: 12-12-79

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

REINFORCEMENT ADJUSTMENT AT UTILITY AND/OR PIPE OPENING IN WALL

STANDARD NO. M(6.03)-79-77 SHEET 1 OF 1

MISCELLANEOUS



ELEVATION
Scale: 3/8" = 1'-0"

Notes:

1. Type III Barricade shall conform to NCHRP Report 350 and the MUTCD except that all barricades to close structures shall be 12 ft. long by 6 ft. high.

2. Striping shall be reflectorized alternate orange and white colors. Right (R) Barricade shown. (L) barricade shall have stripes sloping in opposite direction. If barricades are to be used close road, striping shall be reflectorized alternate white and red colors.

3. Barricade shall be lighted if required by location.

4. Type III Barricades shall be selected from the Preapproved List maintained by the Office of Materials and Technology. Procedures for adding products to the prequalified list may be obtained from the Office of Materials and Technology.

5. If signing is attached to the movable barricade, the signs shall be placed so that no more than 1/3 of the reflective surface of the barricade shall be covered.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 8/31/79

REVISIONS	
SHA	FHWA
12-12-05	·
1-6-06	·
7-24-07	·
·	·

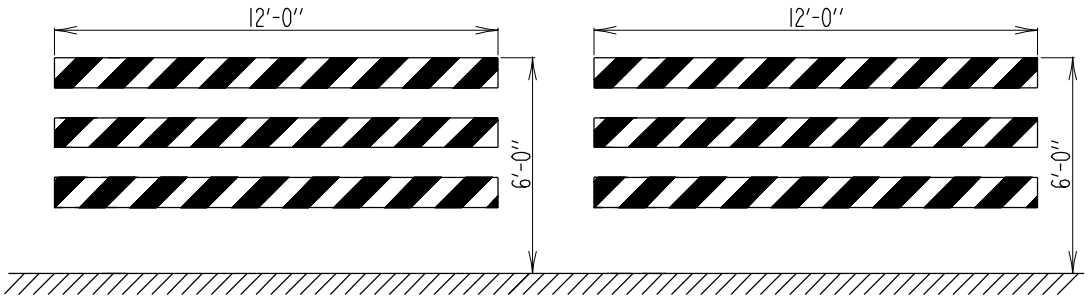
FHWA APPROVAL
DATE: 1-16-80

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

TEMPORARY MOVABLE BARRICADE

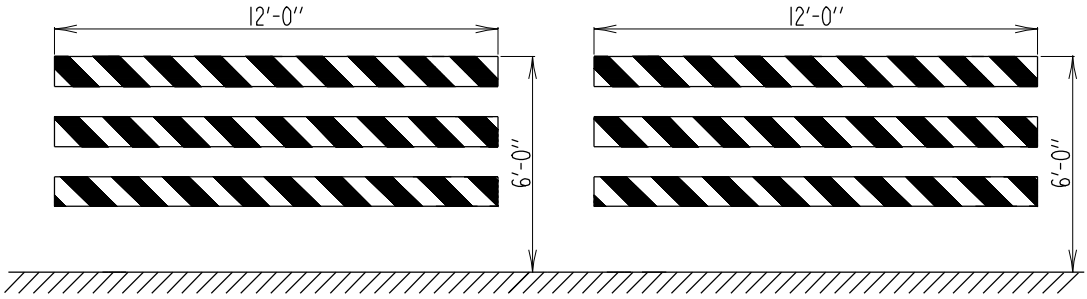
STANDARD NO. M(5.08)-79-82 SHEET 1 OF 2

MISCELLANEOUS



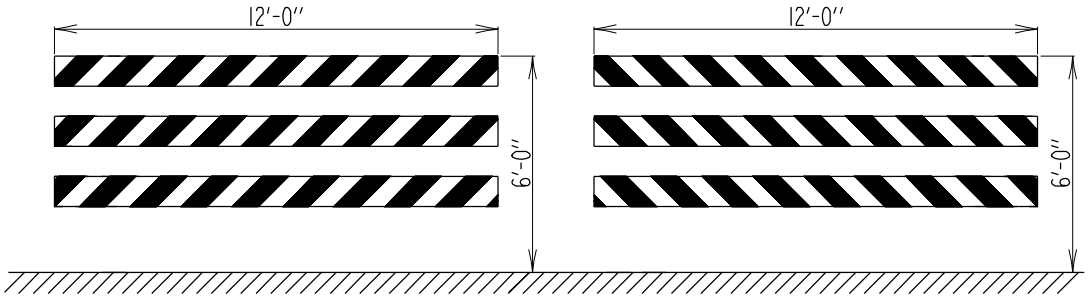
ELEVATION-ROAD CLOSED, TRAFFIC DIRECTED TO LEFT

Scale: 3/16" = 1'-0"



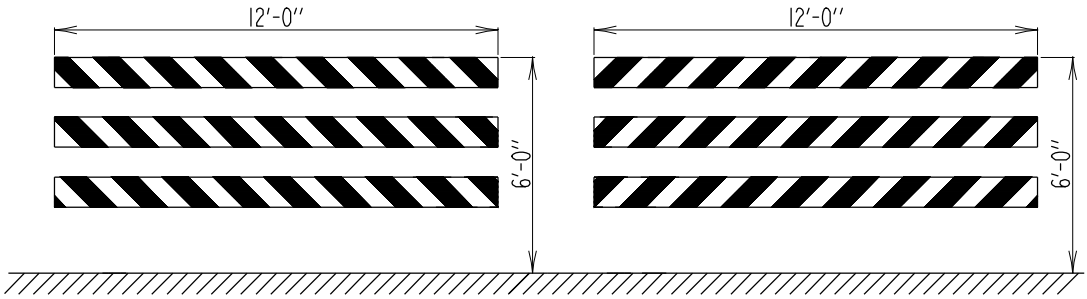
ELEVATION-ROAD CLOSED, TRAFFIC DIRECTED TO RIGHT

Scale: 3/16" = 1'-0"



ELEVATION-ROAD CLOSED, TRAFFIC DIRECTED TO EITHER SIDE

Scale: 3/16" = 1'-0"



ELEVATION-ROAD CLOSED USING WHITE AND RED STRIPES

Scale: 3/16" = 1'-0"

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 1/6/06

REVISIONS	
SHA	FHWA
7-24-07	·
·	·
·	·
·	·

FHWA APPROVAL
DATE: .

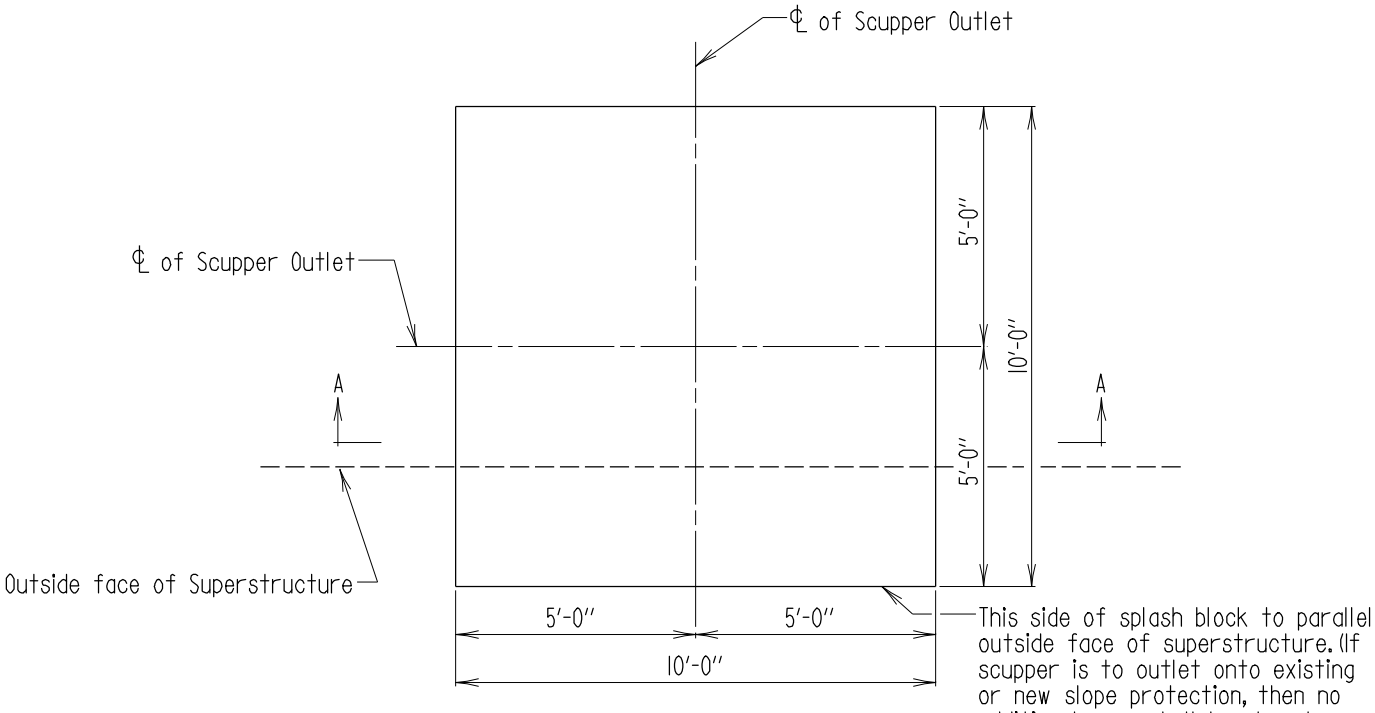
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

TEMPORARY MOVABLE BARRICADE

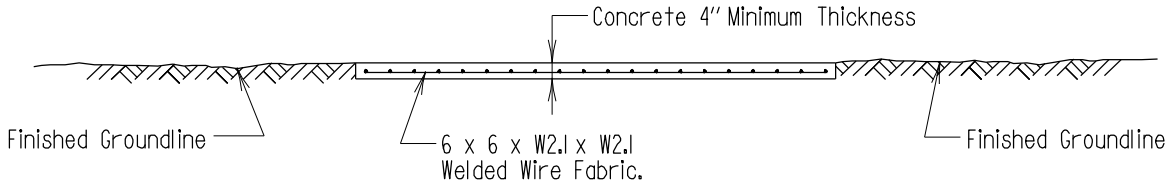
STANDARD NO. M(5.08)-79-82

SHEET 2 OF 2

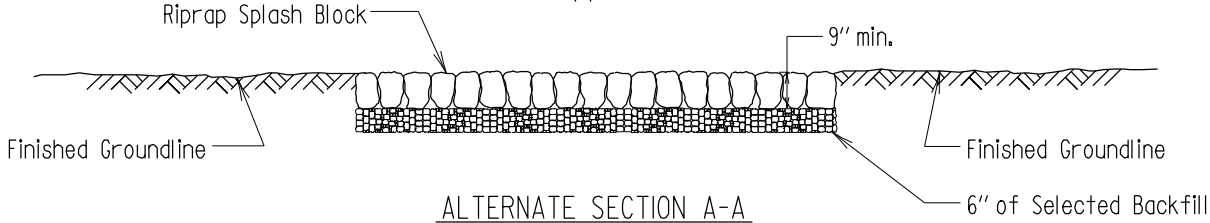
MISCELLANEOUS



PLAN
Scale: 1/4" = 1'-0"



SECTION A-A
Scale: 1/4" = 1'-0"



ALTERNATE SECTION A-A
Scale: 1/4" = 1'-0"

Note:
1. Splash blocks shall be placed at all scuppers that do not directly outlet onto slope protection or into water and are less than 40' above finished ground.
2. Concrete shall be Mix. No. 1 or better.
3. Cost of splash block(s) complete in place, regardless of alternate (including Selected Backfill) shall be measured and paid for at Contract unit price bid on Slope Protection item. If there is no slope protection in the project then cost to be included in Contract price bid on Scuppers or whichever item(s) scuppers are included in.
4. Alternate Section A-A is to be utilized when riprap slope protection is specified for slopes of bridge. All material for riprap for splash block shall conform to the same requirements for the other riprap slope protection for bridge.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 11/14/80

REVISIONS	
SHA	FHWA
7-28-82	8-24-82
5-6-83	11-29-85
2-14-94	·
1-22-01	·

FHWA APPROVAL
DATE: 8-20-81

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

SPLASH BLOCKS FOR SCUPPER OUTLETS

STANDARD NO. M(6.04)-80-119 SHEET 1 OF 1

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-5"	1'-9"	1'-5"
#5	3'-0"	2'-2"	1'-9"
#6	3'-7"	2'-7"	2'-1"
#7	4'-4"	3'-1"	2'-6"
#8	5'-8"	4'-1"	3'-3"
#9	7'-2"	5'-1"	4'-1"
#10	9'-1"	6'-6"	5'-2"
#11	11'-1"	7'-11"	6'-4"

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6" apart.
C - All bars not in Category A spaced 6" or more apart.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/30/81

REVISIONS	
SHA	FHWA
1-22-01	·
11-23-93	·
9-20-05	·
12-4-07	·

FHWA APPROVAL
DATE: 6-8-90

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

BAR LAP DIMENSIONS FOR
GRADE 60 REINFORCING STEEL
IN MIX NO. 6 (4500 P.S.I.) CONCRETE
NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.05)-80-122 SHEET 1 OF 3

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter =	c/c Spacing
	A	B	C			
#4	2'-11"	2'-7"	2'-1"	1½"	3"	3½"
#5	3'-8"	3'-3"	2'-7"	1⅞"	3¾"	4⅜"
#6	4'-5"	3'-10"	3'-1"	2¼"	4½"	5¼"
#7	5'-3"	4'-7"	3'-8"	2⅝"	5¼"	6⅛"
#8	6'-10"	6'-1"	4'-10"	3"	6"	7"
#9	8'-8"	7'-8"	6'-1"	3⅜"	6¾"	7⅞"
#10	11'-0"	9'-8"	7'-9"	3¾"	7⅝"	8⅞"
#11	13'-6"	11'-11"	9'-6"	4¼"	8½"	9⅞"

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6" apart.
C - All bars not in Category A spaced 6" or more apart.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

FHWA APPROVAL
DATE:

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

BAR LAP DIMENSIONS FOR
GRADE 60 REINFORCING STEEL
IN MIX NO. 6 (4500 P.S.I.) CONCRETE
EPOXY COATED REINFORCING CASE NO.1

STANDARD NO. M(6.05)-80-122 SHEET 2 OF 3

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-11"	2'-1"	1'-8"
#5	3'-7"	2'-7"	2'-1"
#6	4'-4"	3'-1"	2'-6"
#7	5'-1"	Does Not Exist	2'-11"
#8	6'-8"		3'-10"
#9	8'-5"		4'-10"
#10	10'-9"		6'-2"
#11	13'-2"		7'-7"

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6" apart.
C - All bars not in Category A spaced 6" or more apart.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

CASE NO.2 - For bars coated with epoxy not in Case No. 1.

APPROVAL
E.S. Friedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

FHWA APPROVAL	
DATE:	

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO. 6 (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.2

STANDARD NO. M(6.05)-80-122 SHEET 3 OF 3

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2′-5″	1′-9″	1′-5″
#5	3′-0″	2′-2″	1′-9″
#6	3′-7″	2′-7″	2′-1″
#7	4′-4″	3′-1″	2′-6″
#8	5′-8″	4′-1″	3′-3″
#9	7′-2″	5′-1″	4′-1″
#10	9′-1″	6′-6″	5′-2″
#11	11′-1″	7′-11″	6′-4″

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12″ or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6″ apart.
C - All bars not in Category A spaced 6″ or more apart.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."

APPROVAL
E.S. Friedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/30/81

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: 6-8-90

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO. 6 (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.05)-80-122(L)

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter =	c/c Spacing
	A	B	C			
#4	2'-11"	2'-7"	2'-1"	1½"	3"	3½"
#5	3'-8"	3'-3"	2'-7"	1⅞"	3¾"	4⅜"
#6	4'-5"	3'-10"	3'-1"	2¼"	4½"	5¼"
#7	5'-3"	4'-7"	3'-8"	2⅝"	5¼"	6⅛"
#8	6'-10"	6'-1"	4'-10"	3"	6"	7"
#9	8'-8"	7'-8"	6'-1"	3⅜"	6¾"	7⅞"
#10	11'-0"	9'-8"	7'-9"	3¾"	7⅝"	8⅞"
#11	13'-6"	11'-11"	9'-6"	4¼"	8½"	9⅞"

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6" apart.
C - All bars not in Category A spaced 6" or more apart.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: .

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

BAR LAP DIMENSIONS FOR
GRADE 60 REINFORCING STEEL
IN MIX NO. 6 (4500 P.S.I.) CONCRETE
EPOXY COATED REINFORCING CASE NO.1

STANDARD NO. M(6.05)-80-122(L) SHEET 2 OF 3

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2′-11″	2′-1″	1′-8″
#5	3′-7″	2′-7″	2′-1″
#6	4′-4″	3′-1″	2′-6″
#7	5′-1″	Does Not Exist	2′-11″
#8	6′-8″		3′-10″
#9	8′-5″		4′-10″
#10	10′-9″		6′-2″
#11	13′-2″		7′-7″

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12″ or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6″ apart.
C - All bars not in Category A spaced 6″ or more apart.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."

CASE NO.2 - For bars coated with epoxy not in Case No. 1.

APPROVAL
E.S. Freudenberger DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL	
DATE:	

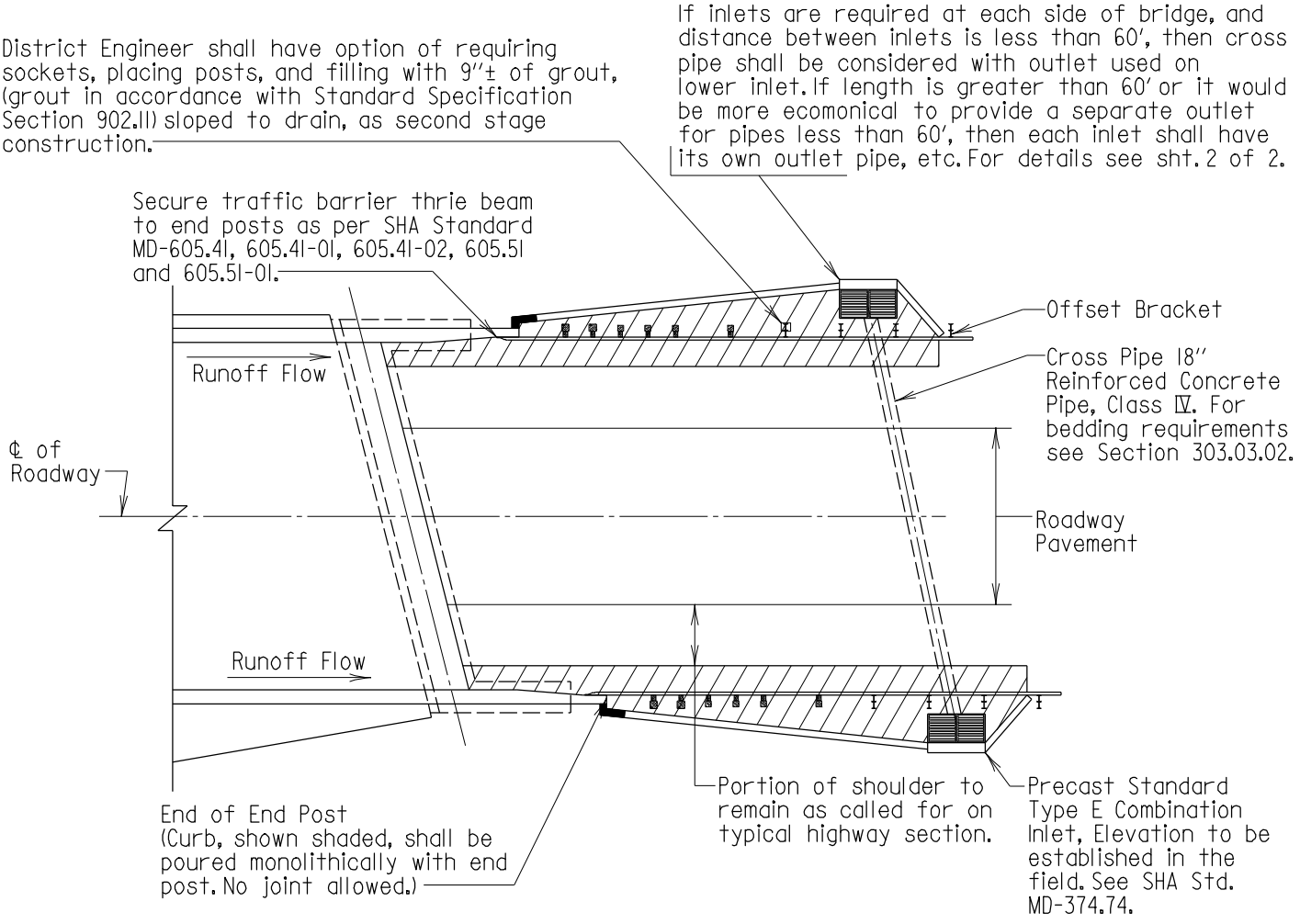
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO. 6 (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.2

STANDARD NO. M(6.05)-80-122(L) SHEET 3 OF 3

MISCELLANEOUS



PLAN

Scale: 1" = 20'-0"

Notes:

1. Payment for Drainage Inlet at End of Bridge Structure shall be on an each basis. Cost for entire installation of hatched area, curb and gutter, inlet, etc. Cross pipe, outlet pipe, elbows and concrete end section shall be incidental to the unit cost of inlet. Outlet pad will be paid for separately.
2. Open Approach Roadway is defined as a highway with full shoulders, no curbed sections, sidewalks and/or raised medians.
3. See note on General Plan and Elevation as to which ends of structure will require inlets.
4. Traffic barrier posts shall be driven prior to placing concrete gutter pan except if option above is utilized.
5. See sheet 2 of 2 for additional details.

APPROVAL
E.S. Freedman DEPUTY CHIEF ENGR. BRIDGE DEVEL.
DATE: 12/23/80

REVISIONS	
SHA	FHWA
1-22-98	·
2-11-00	·
4-23-04	·
1-30-07	·

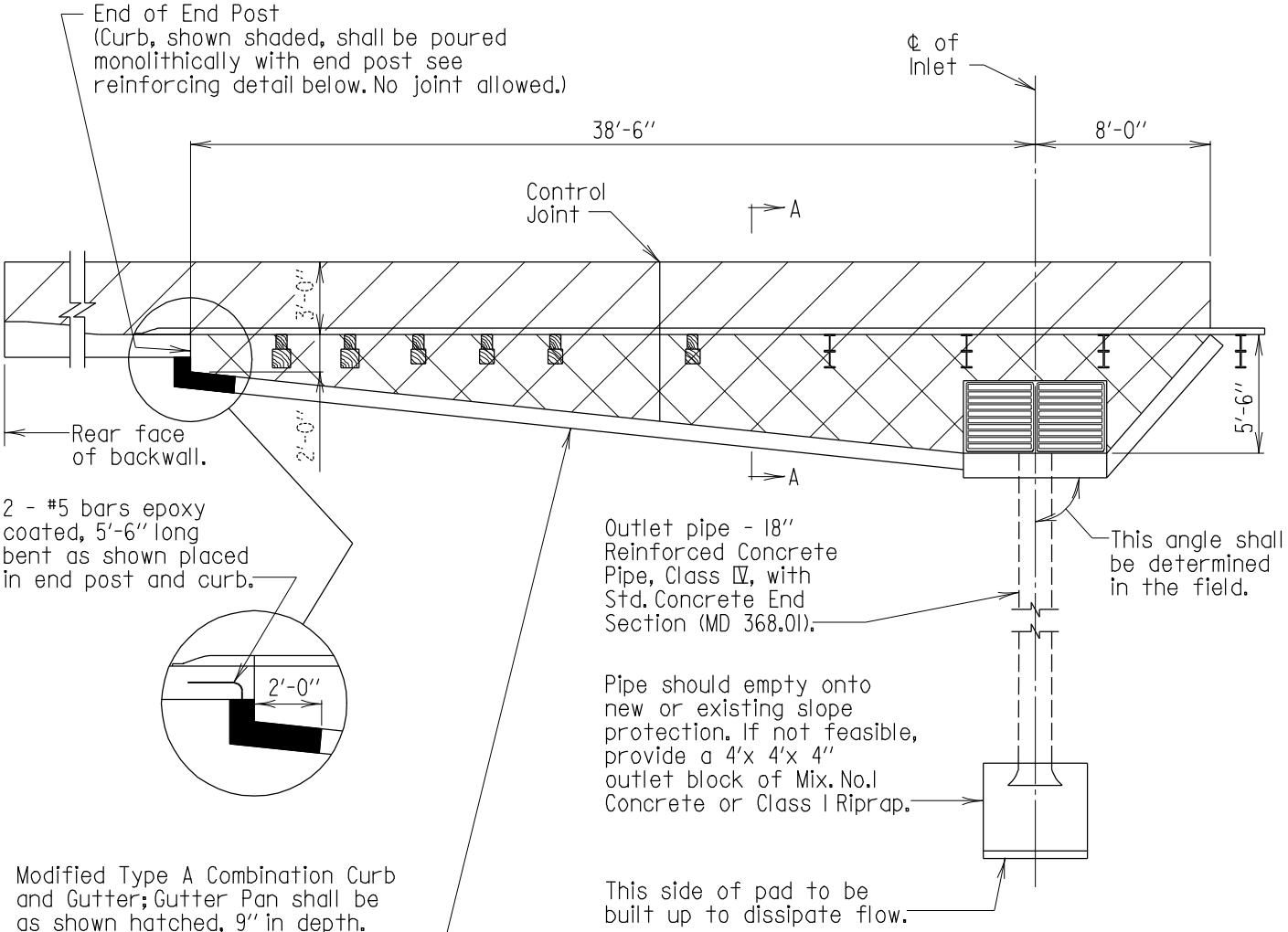
FHWA APPROVAL
DATE: 5-6-81

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

DRAINAGE INLET AT END OF BRIDGE STRUCTURE (OPEN APPROACH ROADWAY)

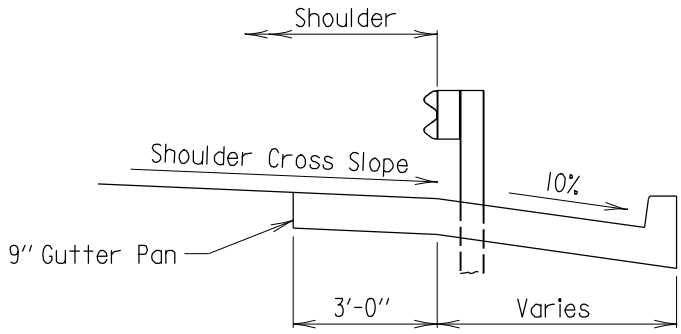
STANDARD NO. M(0.03)-80-123 SHEET 1 OF 2

MISCELLANEOUS



PLAN OF INLET AREA

Scale: 1/8" = 1'-0"



SECTION A-A

Scale: 1/4" = 1'-0"

APPROVAL		
E.S. Freedman DEPUTY CHIEF ENGR. BRIDGE DEVEL. DATE: 10/22/90		
REVISIONS		
SHA	FHWA	
1-7-97	·	
2-11-00	·	
FHWA APPROVAL	1-30-07	·
DATE: ·	·	·

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

DRAINAGE INLET AT END OF BRIDGE STRUCTURE (OPEN APPROACH ROADWAY)

STANDARD NO. M(0.03)-80-123 SHEET 2 OF 2

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	3'-2"	2'-4"	1'-10"
#5	4'-0"	2'-10"	2'-4"
#6	4'-9"	3'-5"	2'-9"
#7	5'-8"	4'-1"	3'-3"
#8	7'-6"	5'-4"	4'-4"
#9	9'-6"	6'-9"	5'-5"
#10	12'-0"	8'-7"	6'-11"
#11	14'-9"	10'-7"	8'-5"

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6" apart.
C - All bars not in Category A spaced 6" or more apart.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps only apply to 4500 p.s.i. lightweight concrete.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/30/81

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

FHWA APPROVAL
DATE: 6-8-90

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.06)-81-126 SHEET 1 OF 3

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter =	c/c Spacing
	A	B	C			
#4	3'-11"	3'-5"	2'-9"	1 1/2"	3"	3 1/2"
#5	4'-10"	4'-3"	3'-5"	1 7/8"	3 3/4"	4 3/8"
#6	5'-10"	5'-2"	4'-1"	2 1/4"	4 1/2"	5 1/4"
#7	6'-11"	6'-1"	4'-11"	2 5/8"	5 1/4"	6 1/8"
#8	9'-1"	8'-0"	6'-5"	3"	6"	7"
#9	11'-6"	10'-2"	8'-2"	3 3/8"	6 3/4"	7 7/8"
#10	14'-7"	12'-11"	10'-4"	3 3/4"	7 5/8"	8 7/8"
#11	17'-11"	15'-10"	12'-8"	4 1/4"	8 1/2"	9 7/8"

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6" apart.
C - All bars not in Category A spaced 6" or more apart.

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps only apply to 4500 p.s.i. lightweight concrete.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

FHWA APPROVAL	
DATE:	

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

BAR LAP DIMENSIONS FOR
GRADE 60 REINFORCING STEEL
IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE
EPOXY COATED REINFORCING CASE NO.1

STANDARD NO. M(6.06)-81-126 SHEET 2 OF 3

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	3'-9"	2'-8"	2'-2"
#5	4'-8"	3'-4"	2'-8"
#6	5'-7"	4'-0"	3'-3"
#7	6'-7"	Does Not Exist	3'-10"
#8	8'-8"		5'-0"
#9	11'-0"		6'-4"
#10	13'-11"		8'-0"
#11	17'-1"		9'-10"

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6" apart.
C - All bars not in Category A spaced 6" or more apart.

CASE NO.2 - For bars coated with epoxy not in Case No.1.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps only apply to 4500 p.s.i. lightweight concrete.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

FHWA APPROVAL
DATE:

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

BAR LAP DIMENSIONS FOR
GRADE 60 REINFORCING STEEL
IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE
EPOXY COATED REINFORCING CASE NO.2

STANDARD NO. M(6.06)-81-126 SHEET 3 OF 3

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	3′-2″	2′-4″	1′-10″
#5	4′-0″	2′-10″	2′-4″
#6	4′-9″	3′-5″	2′-9″
#7	5′-8″	4′-1″	3′-3″
#8	7′-6″	5′-4″	4′-4″
#9	9′-6″	6′-9″	5′-5″
#10	12′-0″	8′-7″	6′-11″
#11	14′-9″	10′-7″	8′-5″

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12″ or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6″ apart.
C - All bars not in Category A spaced 6″ or more apart.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps only apply to 4500 p.s.i. lightweight concrete.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/30/81

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: 6-8-90

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.06)-81-126(L)

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter =	c/c Spacing
	A	B	C			
#4	3′-11″	3′-5″	2′-9″	1½″	3″	3½″
#5	4′-10″	4′-3″	3′-5″	1⅞″	3¾″	4⅜″
#6	5′-10″	5′-2″	4′-1″	2¼″	4½″	5¼″
#7	6′-11″	6′-1″	4′-11″	2⅝″	5¼″	6⅛″
#8	9′-1″	8′-0″	6′-5″	3″	6″	7″
#9	11′-6″	10′-2″	8′-2″	3⅜″	6¾″	7⅞″
#10	14′-7″	12′-11″	10′-4″	3¾″	7⅝″	8⅞″
#11	17′-11″	15′-10″	12′-8″	4¼″	8½″	9⅞″

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12″ or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6″ apart.
C - All bars not in Category A spaced 6″ or more apart.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps only apply to 4500 p.s.i. lightweight concrete.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL	
DATE:	

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

BAR LAP DIMENSIONS FOR
GRADE 60 REINFORCING STEEL
IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE
EPOXY COATED REINFORCING CASE NO.1

STANDARD NO. M(6.06)-81-126(L) SHEET 2 OF 3

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	3'-9"	2'-8"	2'-2"
#5	4'-8"	3'-4"	2'-8"
#6	5'-7"	4'-0"	3'-3"
#7	6'-7"	Does Not Exist	3'-10"
#8	8'-8"		5'-0"
#9	11'-0"		6'-4"
#10	13'-11"		8'-0"
#11	17'-1"		9'-10"

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6" apart.
C - All bars not in Category A spaced 6" or more apart.

CASE NO.2 - For bars coated with epoxy not in Case No.1.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps only apply to 4500 p.s.i. lightweight concrete.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE:

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

BAR LAP DIMENSIONS FOR
GRADE 60 REINFORCING STEEL
IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE
EPOXY COATED REINFORCING CASE NO.2

STANDARD NO. M(6.06)-81-126(L) SHEET 3 OF 3

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-5"	1'-9"	1'-5"
#5	3'-0"	2'-2"	1'-9"
#6	3'-7"	2'-7"	2'-1"
#7	4'-10"	3'-6"	2'-10"
#8	6'-5"	4'-7"	3'-8"
#9	8'-1"	5'-9"	4'-8"
#10	10'-3"	7'-4"	5'-11"
#11	12'-7"	9'-0"	7'-3"

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6" apart.
C - All bars not in Category A spaced 6" or more apart.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/30/81

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

FHWA APPROVAL
DATE: 6-8-90

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

BAR LAP DIMENSIONS FOR
GRADE 60 REINFORCING STEEL
IN MIX NO.3 (3500 P.S.I.) CONCRETE
NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.07)-81-127 SHEET 1 OF 3

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter =	c/c Spacing
	A	B	C			
#4	2'-11"	2'-7"	2'-1"	1 1/2"	3"	3 1/2"
#5	3'-8"	3'-3"	2'-7"	1 7/8"	3 3/4"	4 3/8"
#6	4'-5"	3'-10"	3'-1"	2 1/4"	4 1/2"	5 1/4"
#7	5'-11"	5'-3"	4'-2"	2 5/8"	5 1/4"	6 1/8"
#8	7'-9"	6'-10"	5'-6"	3"	6"	7"
#9	9'-10"	8'-8"	6'-11"	3 3/8"	6 3/4"	7 7/8"
#10	12'-5"	11'-0"	8'-10"	3 3/4"	7 5/8"	8 7/8"
#11	15'-3"	13'-6"	10'-10"	4 1/4"	8 1/2"	9 7/8"

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6" apart.
C - All bars not in Category A spaced 6" or more apart.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL
E.S. Fradon DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

FHWA APPROVAL	
DATE:	

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

BAR LAP DIMENSIONS FOR
GRADE 60 REINFORCING STEEL
IN MIX NO.3 (3500 P.S.I.) CONCRETE
EPOXY COATED REINFORCING CASE NO.1

STANDARD NO. M(6.07)-81-127 SHEET 2 OF 3

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2′-11″	2′-1″	1′-8″
#5	3′-7″	2′-7″	2′-1″
#6	4′-4″	3′-1″	2′-6″
#7	5′-9″	Does Not Exist	3′-4″
#8	7′-7″		4′-4″
#9	9′-7″		5′-6″
#10	12′-2″		7′-0″
#11	14′-11″		8′-7″

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12″ or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6″ apart.
C - All bars not in Category A spaced 6″ or more apart.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

CASE NO.2 - For bars coated with epoxy not in Case No. 1.

APPROVAL
E S Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

FHWA APPROVAL	
DATE:	

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

BAR LAP DIMENSIONS FOR
GRADE 60 REINFORCING STEEL
IN MIX NO.3 (3500 P.S.I.) CONCRETE
EPOXY COATED REINFORCING CASE NO.2

STANDARD NO. M(6.07)-81-127 SHEET 3 OF 3

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2′-5″	1′-9″	1′-5″
#5	3′-0″	2′-2″	1′-9″
#6	3′-7″	2′-7″	2′-1″
#7	4′-10″	3′-6″	2′-10″
#8	6′-5″	4′-7″	3′-8″
#9	8′-1″	5′-9″	4′-8″
#10	10′-3″	7′-4″	5′-11″
#11	12′-7″	9′-0″	7′-3″

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12″ or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6″ apart.
C - All bars not in Category A spaced 6″ or more apart.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/30/81

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: 6-8-90

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

BAR LAP DIMENSIONS FOR
GRADE 60 REINFORCING STEEL
IN MIX NO.3 (3500 P.S.I.) CONCRETE
NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.07)-81-127(L) SHEET 1 OF 3

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter =	c/c Spacing
	A	B	C			
#4	2'-11"	2'-7"	2'-1"	1 1/2"	3"	3 1/2"
#5	3'-8"	3'-3"	2'-7"	1 7/8"	3 3/4"	4 3/8"
#6	4'-5"	3'-10"	3'-1"	2 1/4"	4 1/2"	5 1/4"
#7	5'-11"	5'-3"	4'-2"	2 5/8"	5 1/4"	6 1/8"
#8	7'-9"	6'-10"	5'-6"	3"	6"	7"
#9	9'-10"	8'-8"	6'-11"	3 3/8"	6 3/4"	7 7/8"
#10	12'-5"	11'-0"	8'-10"	3 3/4"	7 5/8"	8 7/8"
#11	15'-3"	13'-6"	10'-10"	4 1/4"	8 1/2"	9 7/8"

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6" apart.
C - All bars not in Category A spaced 6" or more apart.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL
E.S. Freedom DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: .

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

BAR LAP DIMENSIONS FOR
GRADE 60 REINFORCING STEEL
IN MIX NO.3 (3500 P.S.I.) CONCRETE
EPOXY COATED REINFORCING CASE NO.1

STANDARD NO. M(6.07)-81-127(L) SHEET 2 OF 3

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2′-11″	2′-1″	1′-8″
#5	3′-7″	2′-7″	2′-1″
#6	4′-4″	3′-1″	2′-6″
#7	5′-9″	Does Not Exist	3′-4″
#8	7′-7″		4′-4″
#9	9′-7″		5′-6″
#10	12′-2″		7′-0″
#11	14′-11″		8′-7″

* LOCATION CATEGORY

A - Bars in horizontal layers in top of pour with 12″ or more of concrete below them such as in: footings, pier caps, etc.
B - All bars not in Category A spaced less than 6″ apart.
C - All bars not in Category A spaced 6″ or more apart.

Note:
1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."

CASE NO.2 - For bars coated with epoxy not in Case No. 1.

APPROVAL
E S Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: .

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

BAR LAP DIMENSIONS FOR
GRADE 60 REINFORCING STEEL
IN MIX NO.3 (3500 P.S.I.) CONCRETE
EPOXY COATED REINFORCING CASE NO.2

STANDARD NO. M(6.07)-81-127(L) SHEET 3 OF 3

MISCELLANEOUS

GENERAL NOTES

Concrete:	All concrete shall conform to Mix. No. 6 (4500 psi).
Welded Steel Wire Fabric:	All wire fabric shall be 6 x 6 - W2.9 x W2.9.
Reinforcing Steel:	Reinforcing steel shall conform to ASTM A 615 Grade 60.
Structural Steel:	All structural steel conform to ASTM A 709 Grade 36 or better.
Anchor Bolts:	All anchor bolts shall be ASTM A 325 unless otherwise specified on details.
Connector Loop:	3/4"Φ galvanized or stainless steel rod. Stainless steel rods shall conform to ASTM A 276 for the type specified, galvanizing shall conform to ASTM A 153.
Connector Pin:	The 1 1/4" x 25" connector pin shall be a threaded rod or bolt conforming to ASTM A 307, Grade A. Nuts shall conform to ASTM A 563, Grade DH or DH3 or ASTM A 94, Grade 2H. Washers shall conform to ASTM F 436. The connector pin, nuts and washers shall be galvanized in conformance with ASTM A 153.
Other Connector Devices:	Contractor may use any other connection devices between barrier sections in lieu of the pin and loop, provided they appear on S.H.A. standard plates and have written approval of Chief Engineer.
Temporary Shield:	When specified on the Plans, a shield shall be connected to the temporary precast concrete barrier. The shield shall be designed, furnished, and installed by the Contractor. The height of the shield shall be 6 ft - 6 in. above the roadway surface, and shall have no cracks or openings through which material or debris can pass. The shield will not be measured but the cost will be incidental to the pertinent Temporary Concrete Traffic Barrier for Maintenance of Traffic item.

METHODS OF ANCHORAGE CONNECTION TO CONCRETE DECKS

EXISTING BRIDGE DECK TO BE REMOVED.

Holes for anchor bolts in existing bridge deck shall be drilled. Use 1 1/4"Φ bolts with 5 1/2" x 5 1/2" x 3/4" square washer under existing deck slab, as shown. Bolts shall be of sufficient length that when nut is tight, all the threads of the nut are engaged. Provide Type 'A' plain washer SAE N (narrow) for each 1 1/4"Φ bolt at connection plate.

EXISTING BRIDGE DECK TO REMAIN.

Holes for anchor bolts in existing bridge deck shall be cored. Use 1 1/4"Φ bolts with 5 1/2" x 5 1/2" x 3/4" square washer under existing deck slab, as shown. Bolts shall be of sufficient length that when nut is tight, all the threads of the nut are engaged. Provide Type 'A' plain washer SAE N (narrow) for each 1 1/4" bolt at connection plate. The Contractor is alerted that as little damage as possible shall be done to the existing reinforcement steel. Therefore, the Contractor shall locate the reinforcement steel and space the bolts to miss the reinforcement steel, all as directed by the Engineer. Fill all cored holes with epoxy grout after barrier is removed. (See below for grout composition).

NEW BRIDGE DECK

1 1/4"Φ bolt to be placed in an epoxy coated open coil anchor insert (cast in slab) having a minimum working load tension strength of 16 000 lb and shear strength of 13 000 lb with a minimum 7 1/2" length. Coil to be tapped for a 1 1/4" N.C. thread bolt. No insert shall be longer than slab depth minus 1". Provide Type 'A' plain washer SAE N (narrow) for each 1 1/4"Φ bolt at connection plate. Fill all inserts with epoxy grout after barrier is removed. (See below for grout composition).

The Contractor may opt to utilize a 1 1/4"Φ bolt placed in a 1 3/8"Φ drilled hole filled with high strength resin in lieu of the coil insert. The anchorage system shall meet the same strength properties as specified for the coil inserts verified by pullout tests monitored by the SHA's Office of Materials and Technology.

GROUT COMPOSITION

Any areas of bridge decks, to remain in place, damaged as a result of anchoring temporary concrete barriers (anchor holes, etc.) shall be repaired to the satisfaction of the Engineer using an epoxy grout conforming to 902.11 (d).

Note:
The Contractor has the option of using either Jersey barrier or Type F barrier made prior to May 1, 2004 or this Type F barrier for temporary barrier until July 1, 2006, so long as only one type of barrier is used on this project.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/6/83

REVISIONS	
SHA	FHWA
5-21-04	·
6-28-04	·
8-5-04	·
11-29-04	·

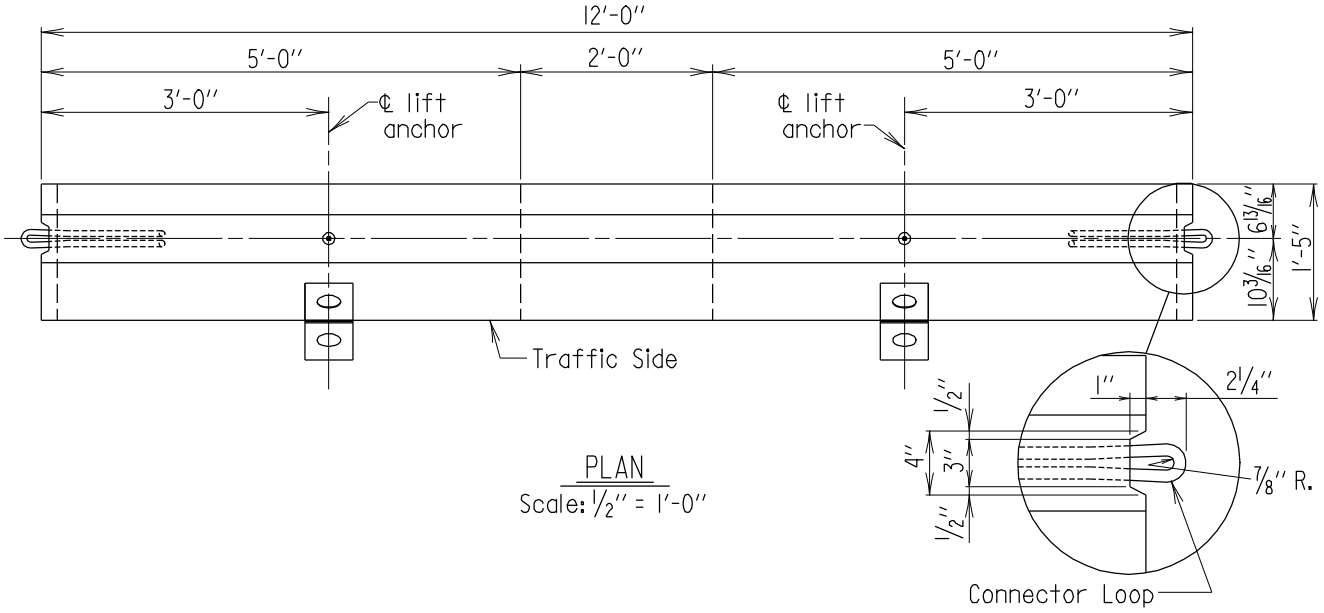
FHWA APPROVAL
DATE: 6-8-90

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

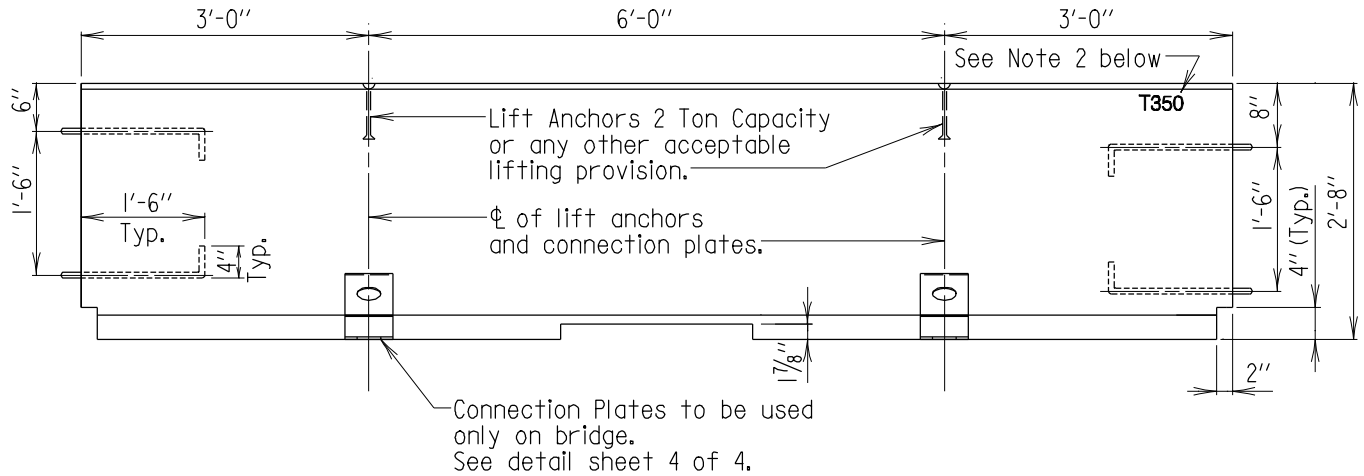
TEMPORARY PRECAST SINGLE FACE F-TYPE CONCRETE BARRIER

STANDARD NO. M(5.09)-83-143 SHEET 1 OF 4

MISCELLANEOUS



PLAN
Scale: 1/2" = 1'-0"



END A

END B

ELEVATION
Scale: 1/2" = 1'-0"

Notes:
1. One connector pin shall be furnished with each barrier. The cost of the connector pin shall be incidental to the item precast temporary concrete barrier.
2. All barriers shall have "T350" imprinted on top end of barrier. Imprint shall have a minimum depth of 1/4" and a minimum height of 2".

APPROVAL
C.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/6/83

REVISIONS	
SHA	FHWA
4-4-02	·
5-21-04	·
6-28-04	·
8-5-04	·

FHWA APPROVAL
DATE: 6-8-90

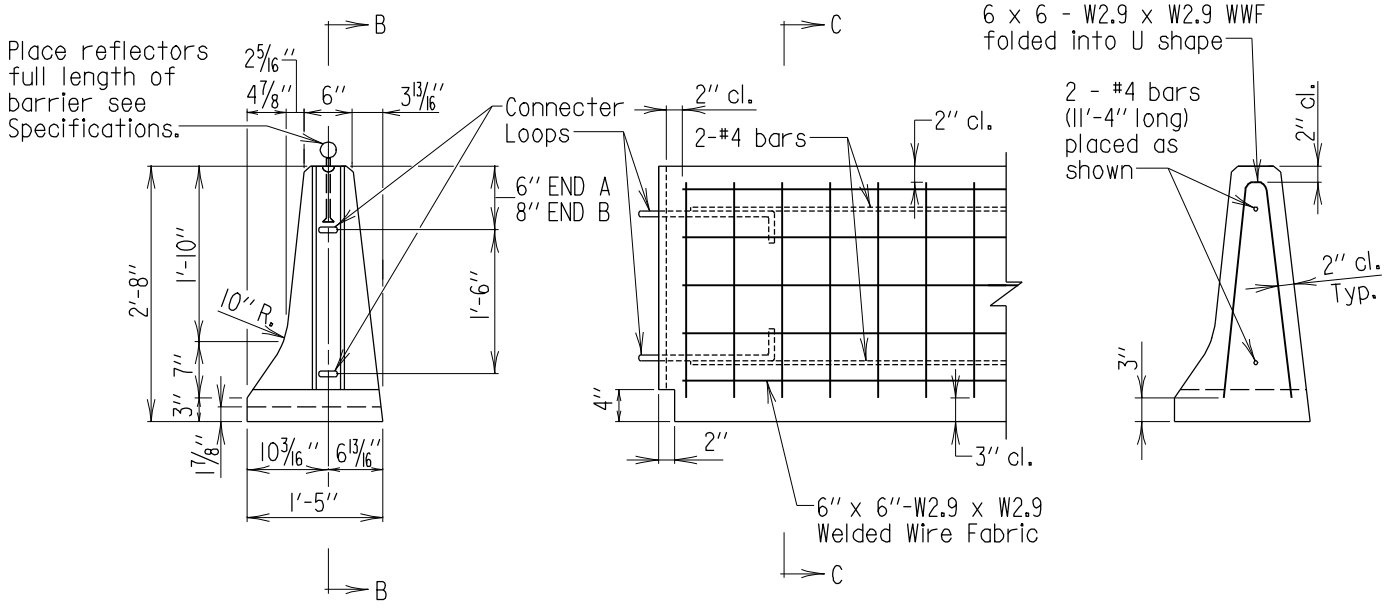
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

TEMPORARY PRECAST SINGLE FACE F-TYPE CONCRETE BARRIER

STANDARD NO. M(5.09)-83-143

SHEET 2 OF 4

MISCELLANEOUS



SECTION B-B

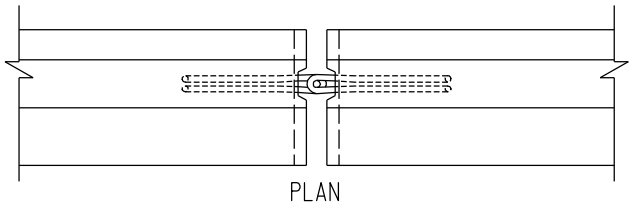
SECTION C-C

END VIEW

Scale: 1/2" = 1'-0"

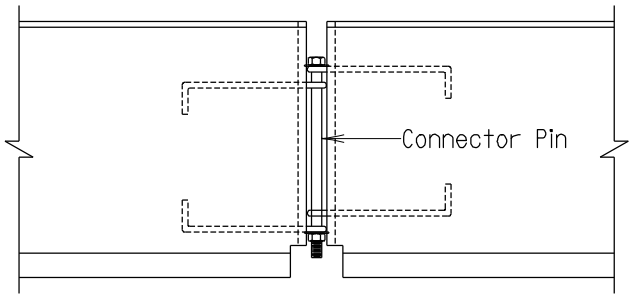
REINFORCING STEEL DETAILS

Scale: 1/2" = 1'-0"



PLAN

(Connector pin not shown)



ELEVATION

JOINT DETAILS

Scale: 1/2" = 1'-0"

APPROVAL
C.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/6/83

REVISIONS	
SHA	FHWA
4-4-02	·
5-21-04	·
6-28-04	·
8-5-04	·

FHWA APPROVAL
DATE: 6-8-90

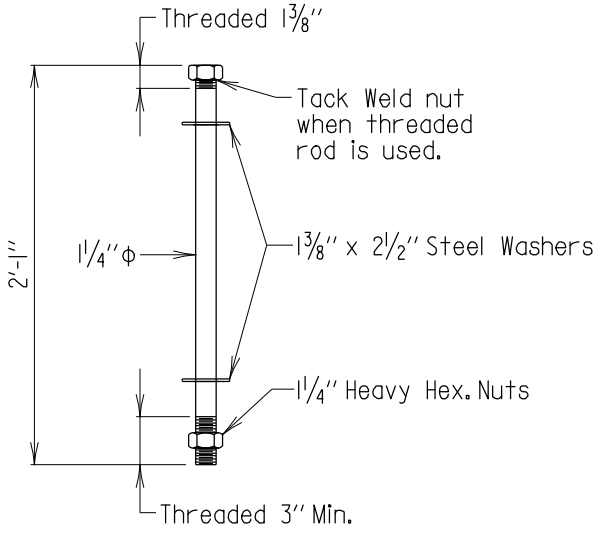
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

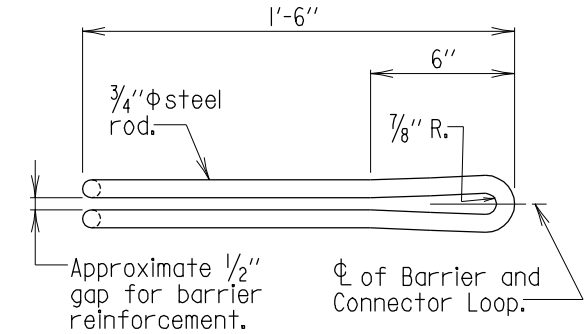
TEMPORARY PRECAST SINGLE FACE F-TYPE CONCRETE BARRIER

STANDARD NO. M(5.09)-83-143

SHEET 3 OF 4

MISCELLANEOUS



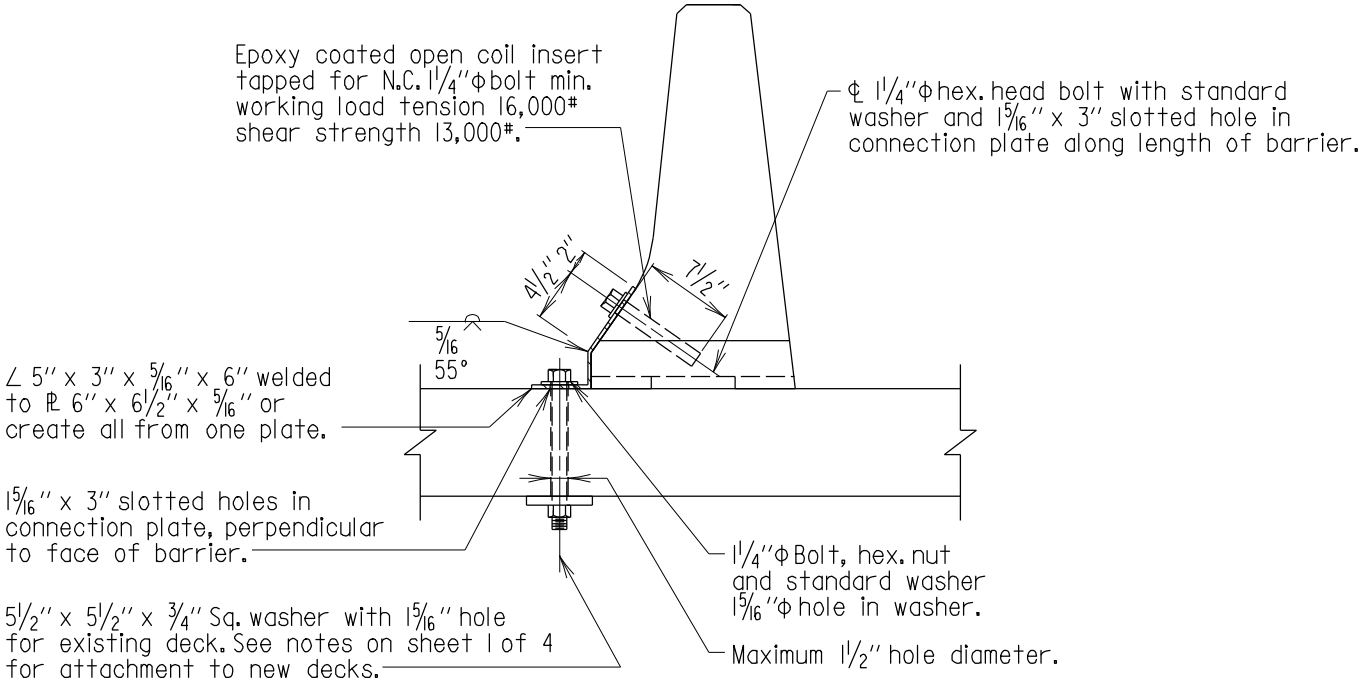


PLAN

ELEVATION

CONNECTOR PIN
Scale: None

CONNECTOR LOOP
Scale: None



CONNECTION DETAIL
Scale: 3/4" = 1'-0"

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/6/83

REVISIONS	
SHA	FHWA
12-4-84	6-8-90
5-17-91	·
4-27-92	·
4-4-02	·

FHWA APPROVAL
DATE: 6-8-90

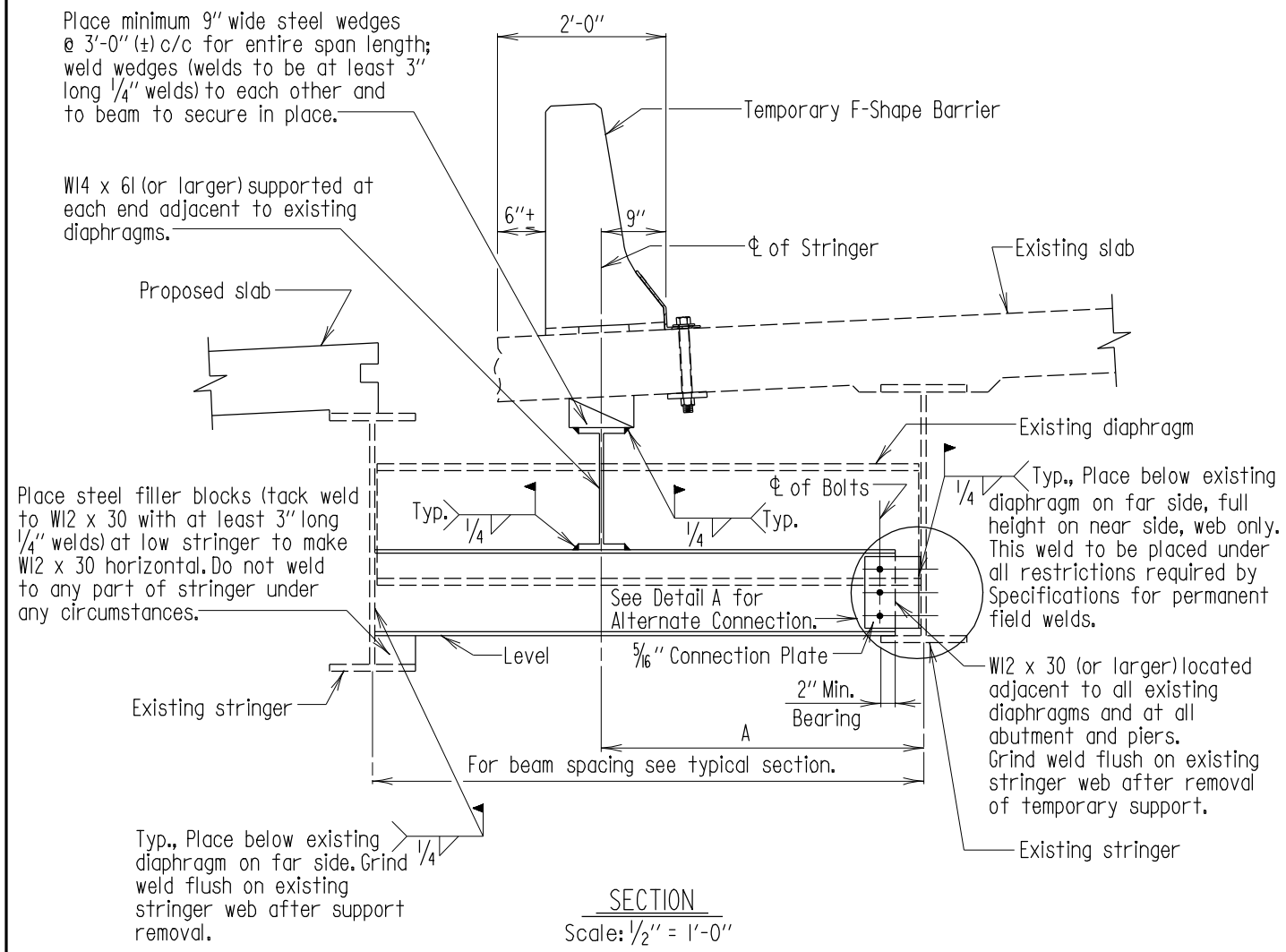
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

TEMPORARY PRECAST SINGLE FACE F-TYPE CONCRETE BARRIER

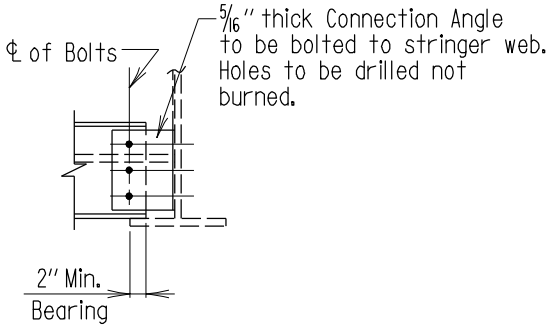
STANDARD NO. M(5.09)-83-143

SHEET 4 OF 4

MISCELLANEOUS



SECTION
Scale: 1/2" = 1'-0"



DETAIL 'A'
Scale: 1/2" = 1'-0"

Notes:
1. Existing structure shown in dashed lines.
2. This detail is only required where A dimension is 2'-6" or greater.
3. This detail can be used for maximum stringer spacing of 10' and maximum diaphragm spacing of 25'.
4. All structural steel to be ASTM A 709 Grade 36 or better.
5. All bolts to be 7/8" ϕ ASTM A-325 and holes to be 15/16" ϕ.
6. Member sizes and connections shown are minimums. Engineer shall design.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 9/2/83

REVISIONS	
SHA	FHWA
9-24-96	·
1-22-01	·
10-22-03	·
10-9-07	·

FHWA APPROVAL
DATE: 10-7-83

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

DETAIL OF TEMPORARY SLAB UNDERPINNING DURING STAGE CONSTRUCTION

STANDARD NO. M(8.01)-83-153 SHEET 1 OF 1

MISCELLANEOUS

GENERAL NOTES

Concrete:	All concrete shall conform to Mix. No. 6 (4500 psi).
Welded Steel Wire Fabric:	All wire fabric shall be 6 x 6 - W2.9 x W2.9.
Reinforcing Steel:	Reinforcing steel shall conform to ASTM A 615 Grade 60.
Structural Steel:	All structural steel conform to ASTM A 709 Grade 36 or better.
Anchor Bolts:	All anchor bolts shall be ASTM A 325 unless otherwise specified on details.
Connector Loop:	$\frac{3}{4}$"Φ galvanized or stainless steel rod. Stainless steel rods shall conform to ASTM A 276 for the type specified, galvanizing shall conform to ASTM A 153.
Connector Pin:	The $1\frac{1}{4}$" x 25" connector pin shall be a threaded rod or bolt conforming to ASTM A 307, Grade A. Nuts shall conform to ASTM A 563, Grade DH or DH3 or ASTM A 94, Grade 2H. Washers shall conform to ASTM F 436. The connector pin, nuts and washers shall be galvanized in conformance with ASTM A 153.
Other Connector Devices:	Contractor may use any other connection devices between barrier sections in lieu of the pin and loop, provided they appear on S.H.A. standard plates and have written approval of Chief Engineer.
Temporary Shield:	When specified on the Plans, a shield shall be connected to the temporary precast concrete barrier. The shield shall be designed, furnished, and installed by the Contractor. The height of the shield shall be 6 ft - 6 in. above the roadway surface, and shall have no cracks or openings through which material or debris can pass. The shield will not be measured but the cost will be incidental to the pertinent Temporary Concrete Traffic Barrier for Maintenance of Traffic item.

METHODS OF ANCHORAGE CONNECTION TO CONCRETE DECKS

EXISTING BRIDGE DECK TO BE REMOVED.

Holes for anchor bolts in existing bridge deck shall be drilled. Use $1\frac{1}{4}$"Φ bolts with $5\frac{1}{2}$" x $5\frac{1}{2}$" x $\frac{3}{4}$" square washer under existing deck slab, as shown. Bolts shall be of sufficient length that when nut is tight, all the threads of the nut are engaged. Provide Type 'A' plain washer SAE N (narrow) for each $1\frac{1}{4}$"Φ bolt at connection plate.

EXISTING BRIDGE DECK TO REMAIN.

Holes for anchor bolts in existing bridge deck shall be cored. Use $1\frac{1}{4}$"Φ bolts with $5\frac{1}{2}$" x $5\frac{1}{2}$" x $\frac{3}{4}$" square washer under existing deck slab, as shown. Bolts shall be of sufficient length that when nut is tight, all the threads of the nut are engaged. Provide Type 'A' plain washer SAE N (narrow) for each $1\frac{1}{4}$" bolt at connection plate. The Contractor is alerted that as little damage as possible shall be done to the existing reinforcement steel. Therefore, the Contractor shall locate the reinforcement steel and space the bolts to miss the reinforcement steel, all as directed by the Engineer. Fill all cored holes with epoxy grout after barrier is removed. (See below for grout composition).

NEW BRIDGE DECK

$1\frac{1}{4}$"Φ bolt to be placed in an epoxy coated open coil anchor insert (cast in slab) having a minimum working load tension strength of 16 000 lb and shear strength of 13 000 lb with a minimum $7\frac{1}{2}$" length. Coil to be tapped for a $1\frac{1}{4}$" N.C. thread bolt. No insert shall be longer than slab depth minus 1". Provide Type 'A' plain washer SAE N (narrow) for each $1\frac{1}{4}$"Φ bolt at connection plate. Fill all inserts with epoxy grout after barrier is removed. (See below for grout composition).

The Contractor may opt to utilize a $1\frac{1}{4}$"Φ bolt placed in a $1\frac{3}{8}$"Φ drilled hole filled with high strength resin in lieu of the coil insert. The anchorage system shall meet the same strength properties as specified for the coil inserts verified by pullout tests monitored by the SHA's Office of Materials and Technology.

GROUT COMPOSITION

Any areas of bridge decks, to remain in place, damaged as a result of anchoring temporary concrete barriers (anchor holes, etc.) shall be repaired to the satisfaction of the Engineer using an epoxy grout conforming to 902.11 (d).

Note:
The Contractor has the option of using either Jersey barrier or Type F barrier made prior to May 1, 2004 or this Type F barrier for temporary barrier until July 1, 2006, so long as only one type of barrier is used on this project.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 6/15/84

REVISIONS	
SHA	FHWA
5-21-04	·
6-28-04	·
8-5-04	·
11-29-04	·

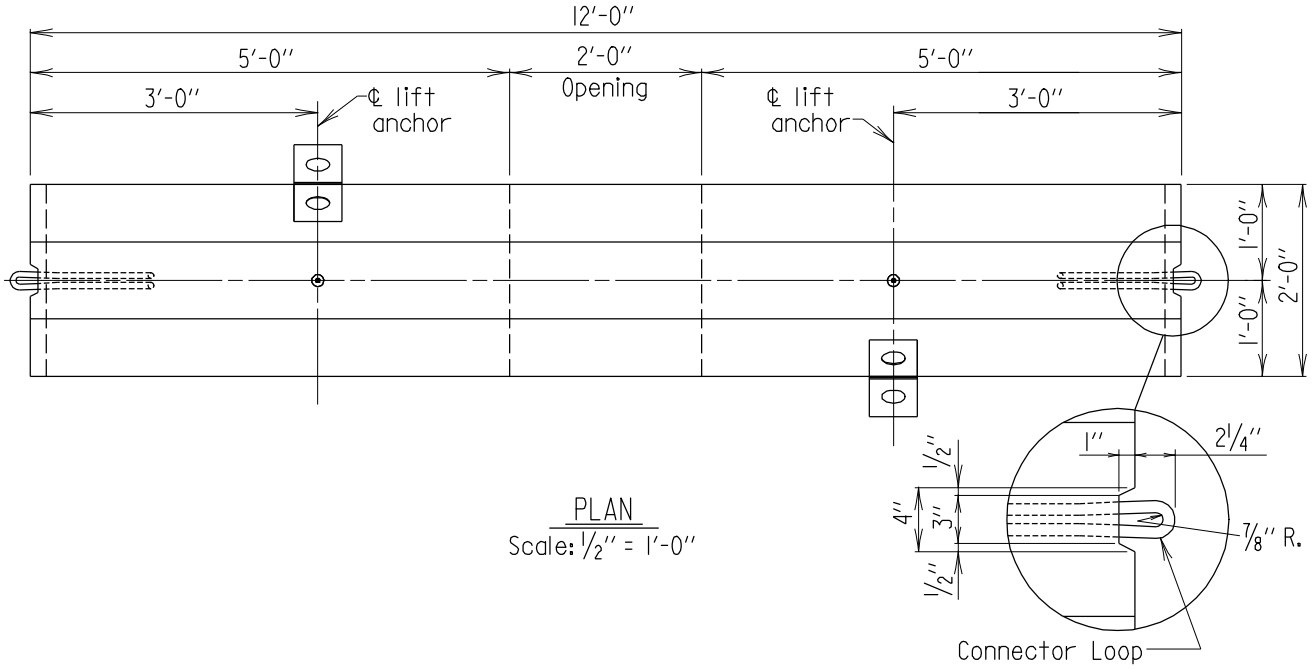
FHWA APPROVAL
DATE: 1-23-85

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

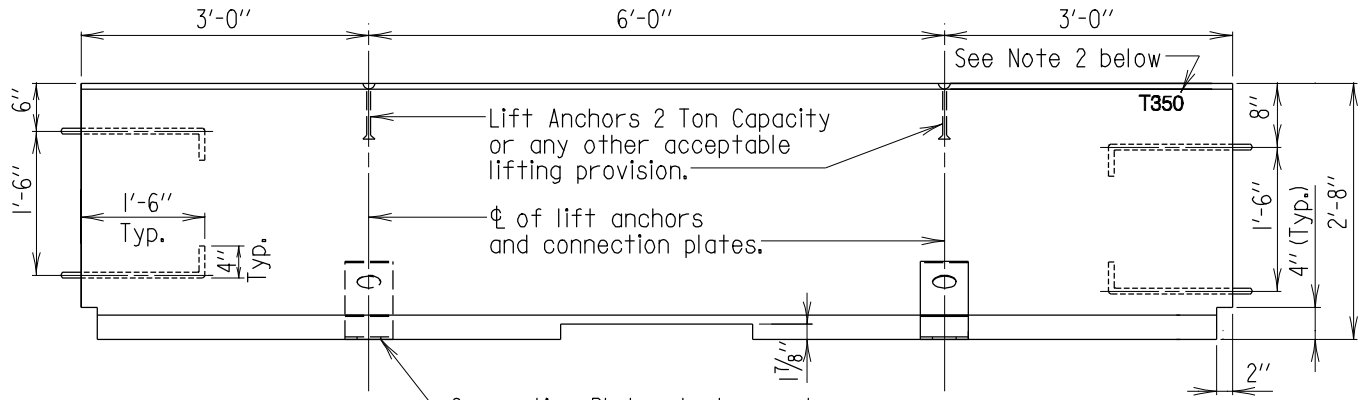
TEMPORARY PRECAST DOUBLE FACE F-TYPE CONCRETE BARRIER

STANDARD NO. M(5.10)-84-158 SHEET 1 OF 4

MISCELLANEOUS



PLAN
Scale: ½" = 1'-0"



END A

END B

ELEVATION
Scale: ½" = 1'-0"

Notes:
1. One connector pin shall be furnished with each barrier. The cost of the connector pin shall be incidental to the item precast temporary concrete barrier.
2. All barriers shall have "T350" imprinted on top end of barrier. Imprint shall have a minimum depth of ¼" and a minimum height of 2".

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 6/15/84

REVISIONS	
SHA	FHWA
4-4-02	·
5-21-04	·
6-28-04	·
8-5-04	·

FHWA APPROVAL
DATE: 1-23-85

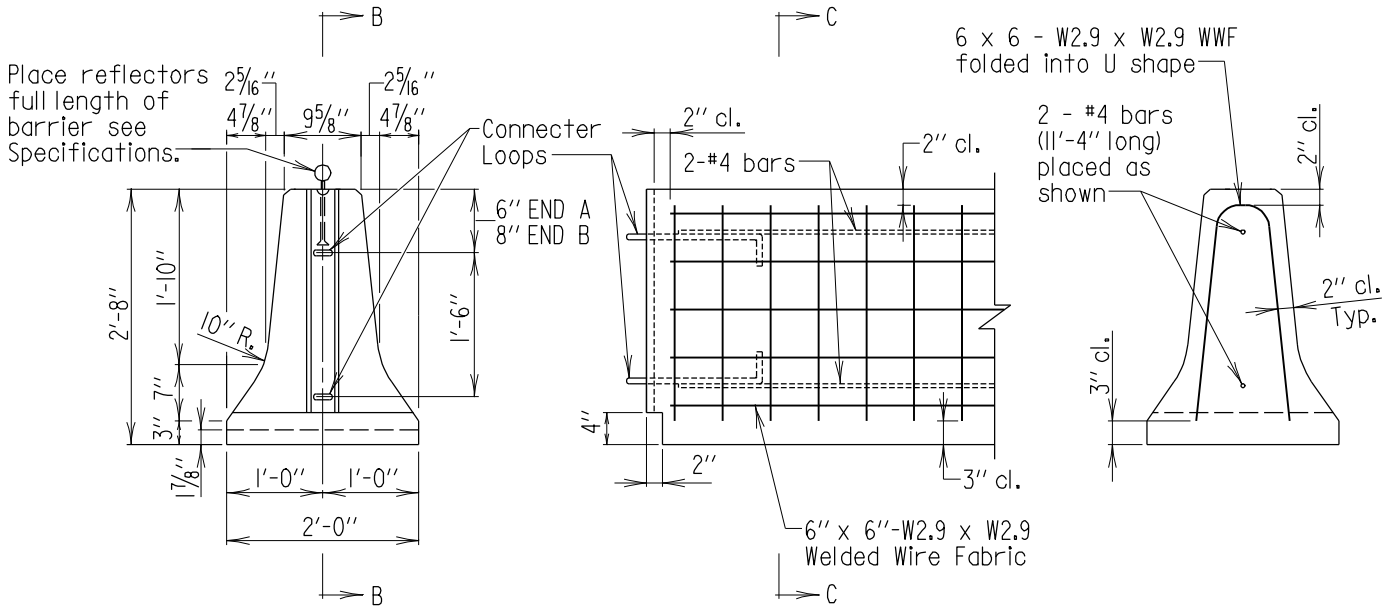
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

TEMPORARY PRECAST DOUBLE FACE F-TYPE CONCRETE BARRIER

STANDARD NO. M(5.10)-84-158

SHEET 2 OF 4

MISCELLANEOUS

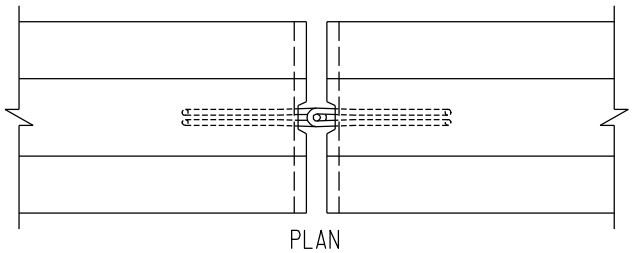


SECTION B-B

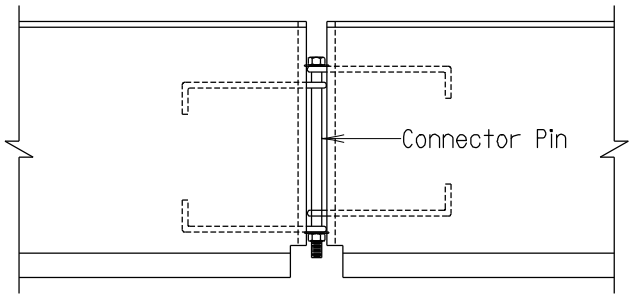
SECTION C-C

END VIEW
Scale: 1/2" = 1'-0"

REINFORCING STEEL DETAILS
Scale: 1/2" = 1'-0"



PLAN
(Connector pin not shown)



ELEVATION

JOINT DETAILS
Scale: 1/2" = 1'-0"

APPROVAL
R S Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 6/15/84

REVISIONS	
SHA	FHWA
4-4-02	·
5-21-04	·
6-28-04	·
8-5-04	·

FHWA APPROVAL
DATE: 1-23-85

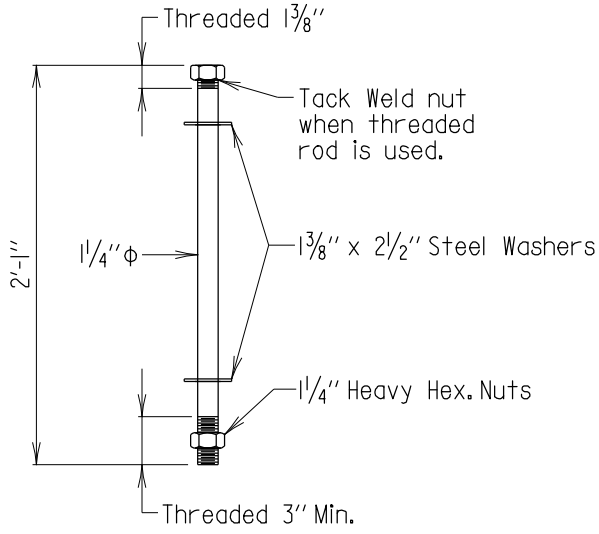
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

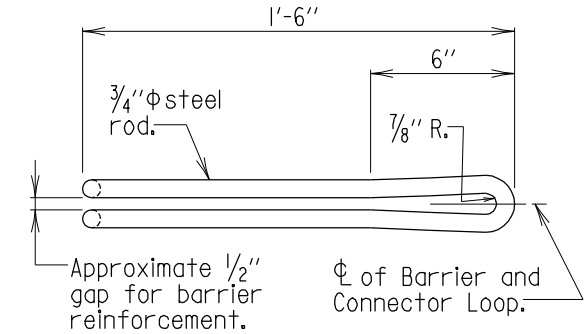
TEMPORARY PRECAST DOUBLE FACE F-TYPE CONCRETE BARRIER

STANDARD NO. M(5.10)-84-158

SHEET 3 OF 4

MISCELLANEOUS





PLAN

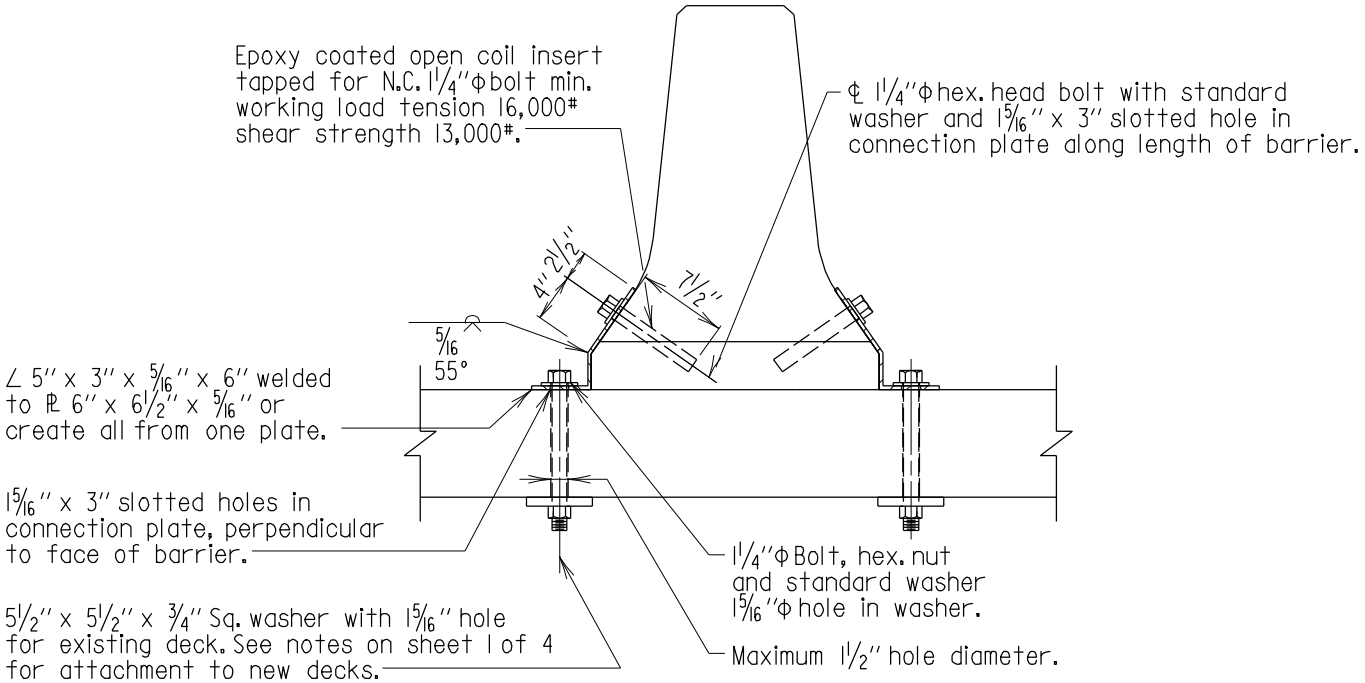
ELEVATION

CONNECTOR PIN

Scale: None

CONNECTOR LOOP

Scale: None



CONNECTION DETAIL

Scale: 3/4" = 1'-0"

APPROVAL
E. S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 6/15/84

REVISIONS	
SHA	FHWA
12-4-84	1-23-85
5-17-91	·
4-27-92	·
4-4-02	·

FHWA APPROVAL
DATE: 1-23-85

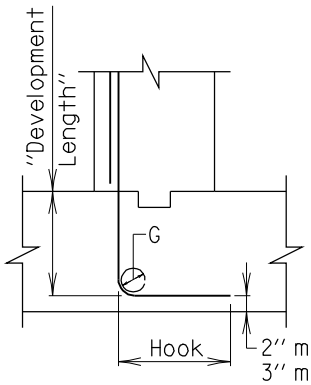
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

TEMPORARY PRECAST DOUBLE FACE F-TYPE CONCRETE BARRIER

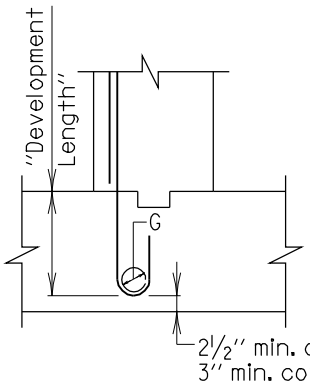
STANDARD NO. M(5.10)-84-158

SHEET 4 OF 4

MISCELLANEOUS



STANDARD 90° HOOK



STANDARD 180° HOOK

BAR SIZE	* LOCATION CATEGORY		
	D	E	F
#4	8"	11"	9"
#5	9"	1'-1"	11"
#6	11"	1'-4"	1'-1"
#7	1'-1"	1'-6"	1'-3"
#8	1'-3"	1'-9"	1'-5"
#9	1'-5"	1'-11"	1'-7"
#10	1'-7"	2'-2"	1'-9"
#11	1'-9"	2'-5"	1'-11"

RECOMMENDED END HOOKS ALL GRADES			
BAR SIZE	Finished bend diameter G in.	180 Degree hooks	90 Degree hooks
#4	3"	6"	8"
#5	3¾"	7"	10"
#6	4½"	8"	1'-0"
#7	5¼"	10"	1'-2"
#8	6"	11"	1'-4"
#9	9½"	1'-3"	1'-7"
#10	10¾"	1'-5"	1'-10"
#11	1'-0"	1'-7"	2'-0"

* LOCATION CATEGORY:

D- All bars terminating with a standard 180° hook with side cover (normal to plane of hook) not less than 2½", and for 90° deg. hook, cover on bar extension beyond hook not less than 2".
E- All bars not in Category D.
F- All bars with hook enclosed vertically or horizontally within ties or stirrup-ties spaced along the full development length not greater than 3d where d is the diameter of the hooked bar.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."
4. If depth of member does not allow bar development length indicated in Categories A, B, and C: Std. No. M(6.14)-90-214; then hook shall be added to all bars not conforming, as per D,E & F.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/4/86

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

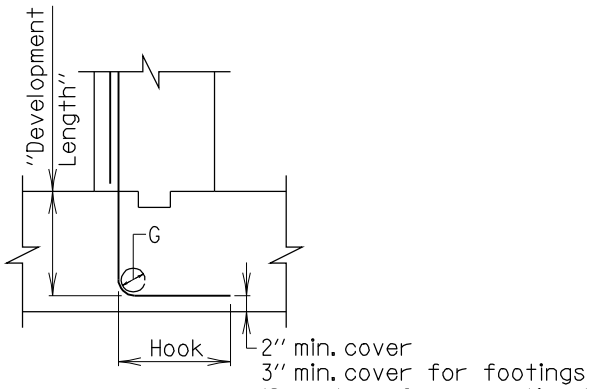
FHWA APPROVAL
DATE: 6-8-90

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

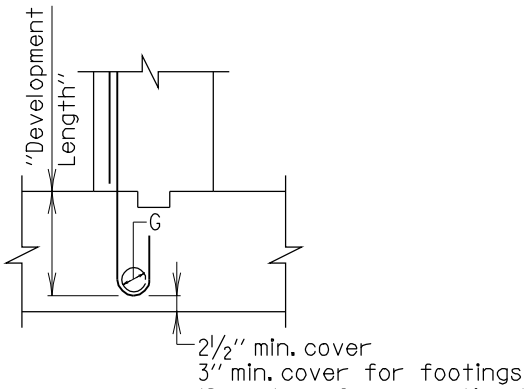
DEVELOPMENT LENGTH DIMENSIONS OF HOOKED BARS FOR GRADE 60 REINFORCING STEEL IN MIX NO. 3 (3500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.08)-86-178 SHEET 1 OF 1

MISCELLANEOUS



STANDARD 90° HOOK



STANDARD 180° HOOK

BAR SIZE	* LOCATION CATEGORY		
	D	E	F
#4	8"	11"	9"
#5	9"	1'-1"	11"
#6	11"	1'-4"	1'-1"
#7	1'-1"	1'-6"	1'-3"
#8	1'-3"	1'-9"	1'-5"
#9	1'-5"	1'-11"	1'-7"
#10	1'-7"	2'-2"	1'-9"
#11	1'-9"	2'-5"	1'-11"

RECOMMENDED END HOOKS ALL GRADES			
BAR SIZE	Finished bend diameter G in.	180 Degree hooks	90 Degree hooks
#4	3"	6"	8"
#5	3¾"	7"	10"
#6	4½"	8"	1'-0"
#7	5¼"	10"	1'-2"
#8	6"	11"	1'-4"
#9	9½"	1'-3"	1'-7"
#10	10¾"	1'-5"	1'-10"
#11	1'-0"	1'-7"	2'-0"

* LOCATION CATEGORY:

D- All bars terminating with a standard 180° hook with side cover (normal to plane of hook) not less than 2½", and for 90° deg. hook, cover on bar extension beyond hook not less than 2".
E- All bars not in Category D.
F- All bars with hook enclosed vertically or horizontally within ties or stirrup-ties spaced along the full development length not greater than 3d where d is the diameter of the hooked bar.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."
4. If depth of member does not allow bar development length indicated in Categories A, B, and C: Std. No. M(6.14)-90-214; then hook shall be added to all bars not conforming, as per D,E & F.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/4/86

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: 6-8-90

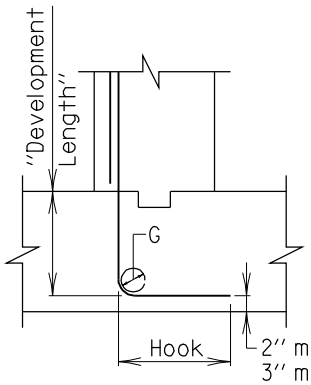
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

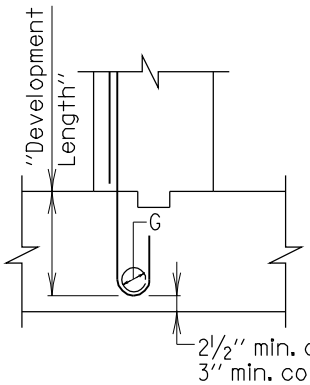
DEVELOPMENT LENGTH DIMENSIONS OF HOOKED BARS FOR GRADE 60 REINFORCING STEEL IN MIX NO. 3 (3500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.08)-86-178(L) SHEET 1 OF 1

MISCELLANEOUS



STANDARD 90° HOOK



STANDARD 180° HOOK

BAR SIZE	* LOCATION CATEGORY		
	D	E	F
#4	9"	1'-0"	10"
#5	11"	1'-3"	1'-0"
#6	1'-1"	1'-6"	1'-2"
#7	1'-3"	1'-9"	1'-5"
#8	1'-5"	2'-0"	1'-7"
#9	1'-7"	2'-3"	1'-10"
#10	1'-9"	2'-6"	2'-0"
#11	1'-11"	2'-9"	2'-3"

RECOMMENDED END HOOKS ALL GRADES			
BAR SIZE	Finished bend diameter G in.	180 Degree hooks	90 Degree hooks
#4	3"	6"	8"
#5	3¾"	7"	10"
#6	4½"	8"	1'-0"
#7	5¼"	10"	1'-2"
#8	6"	11"	1'-4"
#9	9½"	1'-3"	1'-7"
#10	10¾"	1'-5"	1'-10"
#11	1'-0"	1'-7"	2'-0"

* LOCATION CATEGORY:

D- All bars terminating with a standard 180° hook with side cover (normal to plane of hook) not less than 2½", and for 90° deg. hook, cover on bar extension beyond hook not less than 2".
E- All bars not in Category D.
F- All bars with hook enclosed vertically or horizontally within ties or stirrup-ties spaced along the full development length not greater than 3d where d is the diameter of the hooked bar.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths only apply to 4500 P.S.I. lightweight concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."
4. If depth of member does not allow bar development length indicated in Categories A, B, and C: Std. No. M(6.15)-90-215; then hook shall be added to all bars not conforming, as per D,E & F.

APPROVAL
C.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/4/86

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

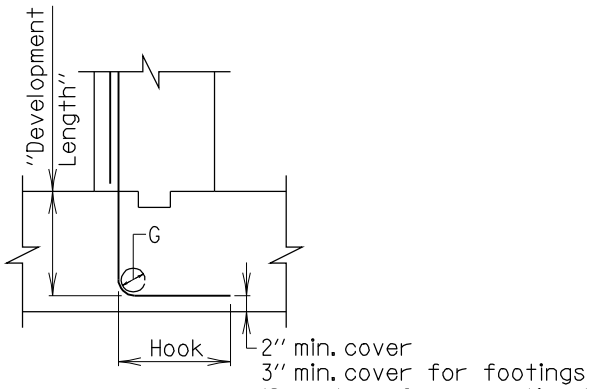
FHWA APPROVAL
DATE: 6-8-90

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

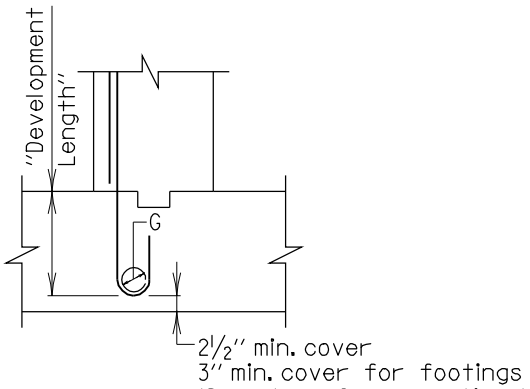
DEVELOPMENT LENGTH DIMENSIONS OF HOOKED BARS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.09)-86-179 SHEET 1 OF 1

MISCELLANEOUS



STANDARD 90° HOOK



STANDARD 180° HOOK

BAR SIZE	* LOCATION CATEGORY		
	D	E	F
#4	9"	1'-0"	10"
#5	11"	1'-3"	1'-0"
#6	1'-1"	1'-6"	1'-2"
#7	1'-3"	1'-9"	1'-5"
#8	1'-5"	2'-0"	1'-7"
#9	1'-7"	2'-3"	1'-10"
#10	1'-9"	2'-6"	2'-0"
#11	1'-11"	2'-9"	2'-3"

RECOMMENDED END HOOKS ALL GRADES			
BAR SIZE	Finished bend diameter G in.	180 Degree hooks	90 Degree hooks
#4	3"	6"	8"
#5	3¾"	7"	10"
#6	4½"	8"	1'-0"
#7	5¼"	10"	1'-2"
#8	6"	11"	1'-4"
#9	9½"	1'-3"	1'-7"
#10	10¾"	1'-5"	1'-10"
#11	1'-0"	1'-7"	2'-0"

* LOCATION CATEGORY:

D- All bars terminating with a standard 180° hook with side cover (normal to plane of hook) not less than 2½", and for 90° deg. hook, cover on bar extension beyond hook not less than 2".
E- All bars not in Category D.
F- All bars with hook enclosed vertically or horizontally within ties or stirrup-ties spaced along the full development length not greater than 3d where d is the diameter of the hooked bar.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths only apply to 4500 P.S.I. lightweight concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."
4. If depth of member does not allow bar development length indicated in Categories A, B, and C: Std. No. M(6.15)-90-215; then hook shall be added to all bars not conforming, as per D,E & F.

APPROVAL
E S Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/4/86

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: 6-8-90

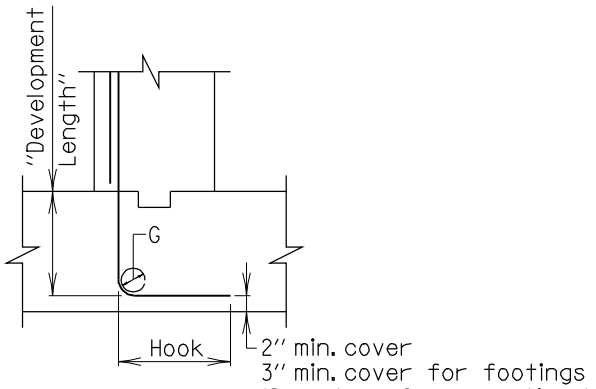
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

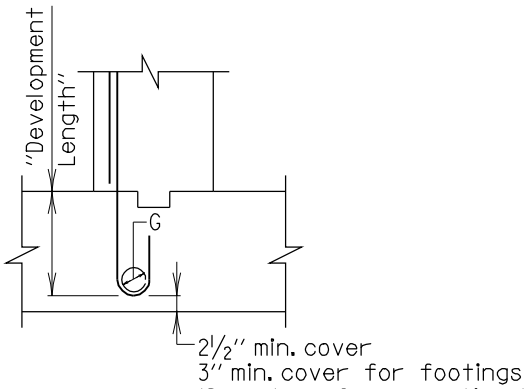
DEVELOPMENT LENGTH DIMENSIONS OF HOOKED BARS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.09)-86-179(L) SHEET 1 OF 1

MISCELLANEOUS



STANDARD 90° HOOK



STANDARD 180° HOOK

BAR SIZE	* LOCATION CATEGORY		
	D	E	F
#4	7"	9"	8"
#5	8"	1'-0"	9"
#6	10"	1'-2"	11"
#7	11"	1'-4"	1'-1"
#8	1'-1"	1'-6"	1'-3"
#9	1'-3"	1'-9"	1'-5"
#10	1'-4"	1'-11"	1'-7"
#11	1'-6"	2'-2"	1'-9"

RECOMMENDED END HOOKS ALL GRADES			
BAR SIZE	Finished bend diameter G in.	180 Degree hooks	90 Degree hooks
#4	3"	6"	8"
#5	3¾"	7"	10"
#6	4½"	8"	1'-0"
#7	5¼"	10"	1'-2"
#8	6"	11"	1'-4"
#9	9½"	1'-3"	1'-7"
#10	10¾"	1'-5"	1'-10"
#11	1'-0"	1'-7"	2'-0"

* LOCATION CATEGORY:

D- All bars terminating with a standard 180° hook with side cover (normal to plane of hook) not less than 2½", and for 90° deg. hook, cover on bar extension beyond hook not less than 2".
E- All bars not in Category D.
F- All bars with hook enclosed vertically or horizontally within ties or stirrup-ties spaced along the full development length not greater than 3d where d is the diameter of the hooked bar.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."
4. If depth of member does not allow bar development length indicated in Categories A, B, and C: Std. No. M(6.16)-90-216; then hook shall be added to all bars not conforming, as per D,E & F.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/4/86

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

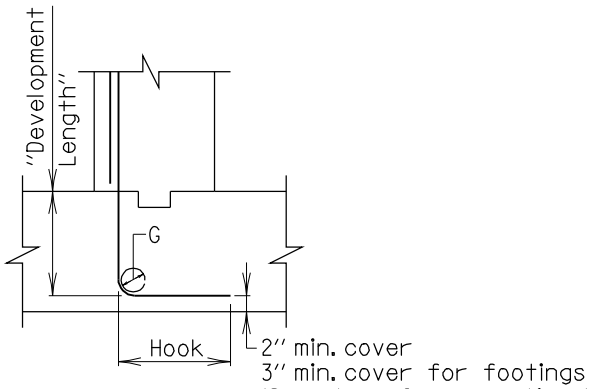
FHWA APPROVAL
DATE: 6-8-90

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

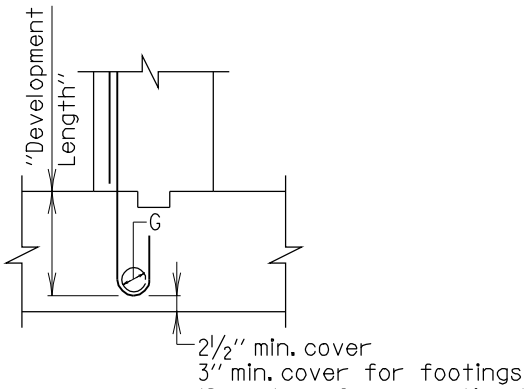
DEVELOPMENT LENGTH DIMENSIONS OF HOOKED BARS FOR GRADE 60 REINFORCING STEEL IN MIX NO. 6 (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.10)-86-180 SHEET 1 OF 1

MISCELLANEOUS



STANDARD 90° HOOK



STANDARD 180° HOOK

BAR SIZE	* LOCATION CATEGORY		
	D	E	F
#4	7"	9"	8"
#5	8"	1'-0"	9"
#6	10"	1'-2"	11"
#7	11"	1'-4"	1'-1"
#8	1'-1"	1'-6"	1'-3"
#9	1'-3"	1'-9"	1'-5"
#10	1'-4"	1'-11"	1'-7"
#11	1'-6"	2'-2"	1'-9"

RECOMMENDED END HOOKS ALL GRADES			
BAR SIZE	Finished bend diameter G in.	180 Degree hooks	90 Degree hooks
#4	3"	6"	8"
#5	3¾"	7"	10"
#6	4½"	8"	1'-0"
#7	5¼"	10"	1'-2"
#8	6"	11"	1'-4"
#9	9½"	1'-3"	1'-7"
#10	10¾"	1'-5"	1'-10"
#11	1'-0"	1'-7"	2'-0"

* LOCATION CATEGORY:

D- All bars terminating with a standard 180° hook with side cover (normal to plane of hook) not less than 2½", and for 90° deg. hook, cover on bar extension beyond hook not less than 2".
E- All bars not in Category D.
F- All bars with hook enclosed vertically or horizontally within ties or stirrup-ties spaced along the full development length not greater than 3d where d is the diameter of the hooked bar.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fY = 60 ksi."
4. If depth of member does not allow bar development length indicated in Categories A, B, and C: Std. No. M(6.16)-90-216; then hook shall be added to all bars not conforming, as per D,E & F.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 4/4/86

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: 6-8-90

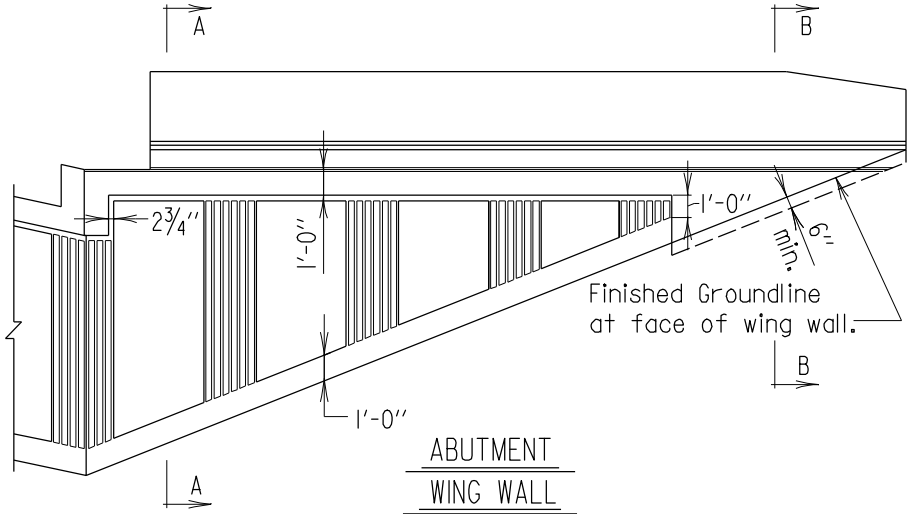
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

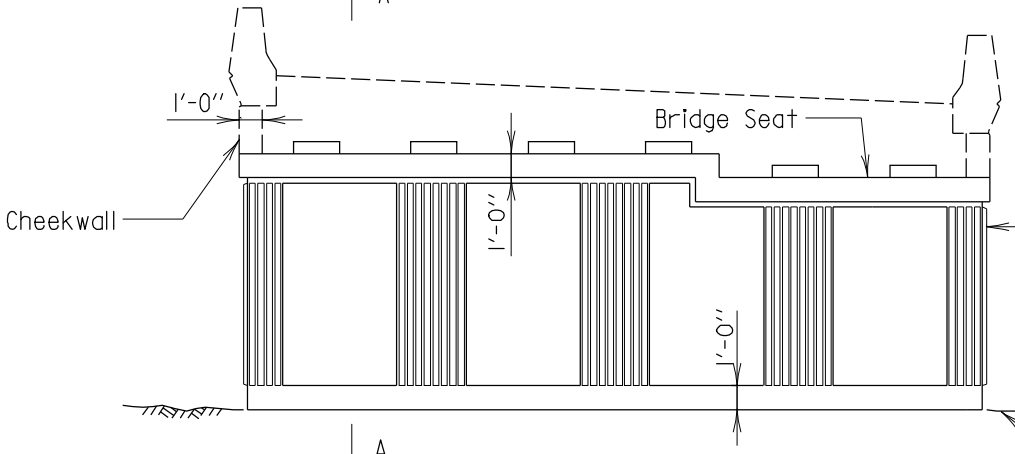
DEVELOPMENT LENGTH DIMENSIONS OF HOOKED BARS FOR GRADE 60 REINFORCING STEEL IN MIX NO. 6 (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.10)-86-180(L) SHEET 1 OF 1

MISCELLANEOUS

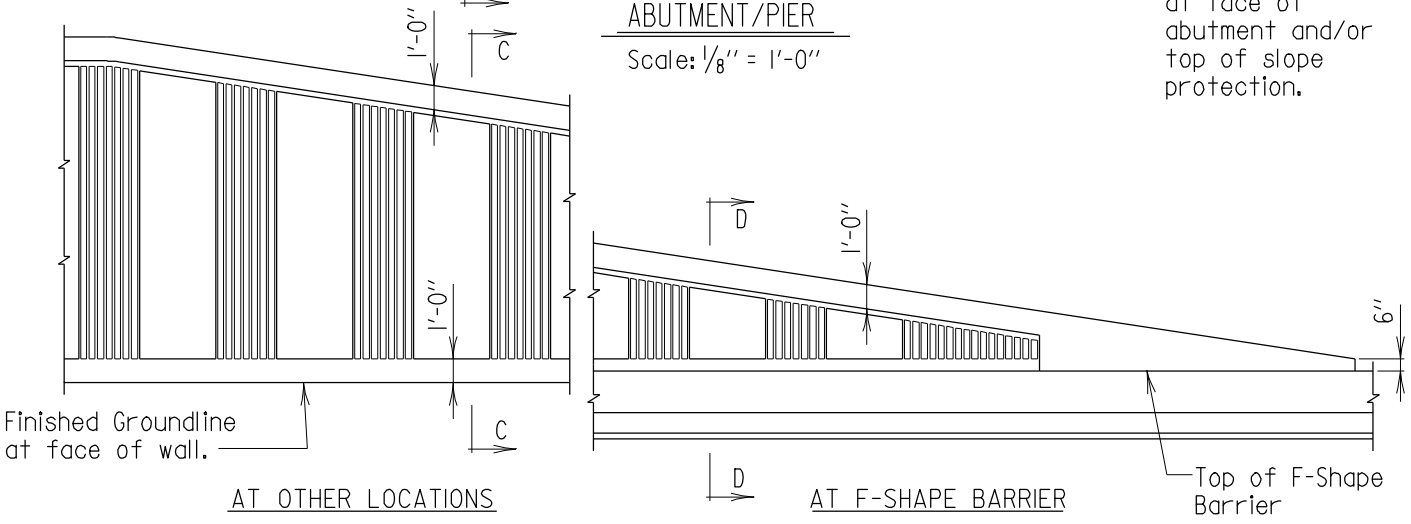


ABUTMENT
WING WALL
Scale: 1/8" = 1'-0"



Note:
Abutment shown
dashed.

ABUTMENT/PIER
Scale: 1/8" = 1'-0"



AT OTHER LOCATIONS

AT F-SHAPE BARRIER

RETAINING WALL
Scale: 1/8" = 1'-0"

Notes:
1. Special layouts may be necessary at certain locations. If details are shown on other Contract Drawings such limitations will take priority over these standards.
2. These striations shall only be used on bridge substructure elements and retaining walls, where specifically called for on Contract Drawings.
3. Cost of all striations, complete-in-place, to be included in other pertinent Contract items.
4. Contraction and expansion joints shall always be located in striated areas.

APPROVAL
E.S. Friedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 11/3/86

REVISIONS	
SHA	FHWA
1-22-01	·
10-22-03	·
·	·
·	·

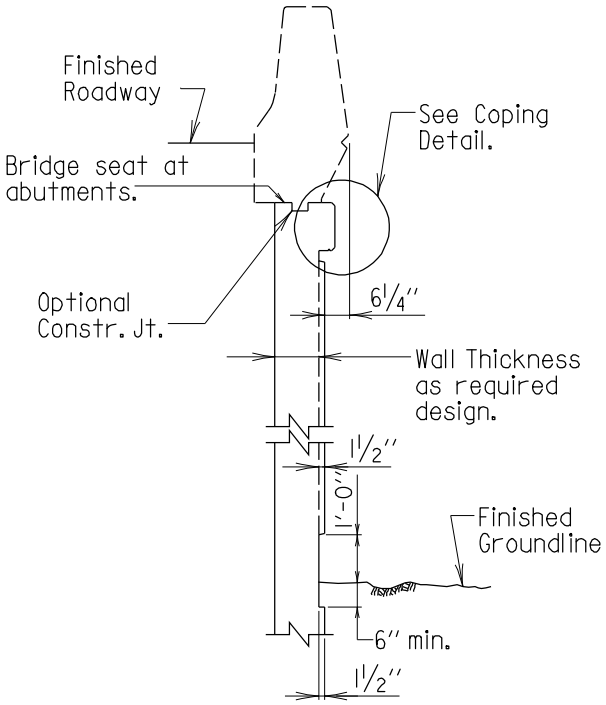
FHWA APPROVAL
DATE: 6-8-90

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

TRAPEZOIDAL STRIATION DETAILS FOR BRIDGE SUBSTRUCTURE UNITS AND RETAINING WALLS

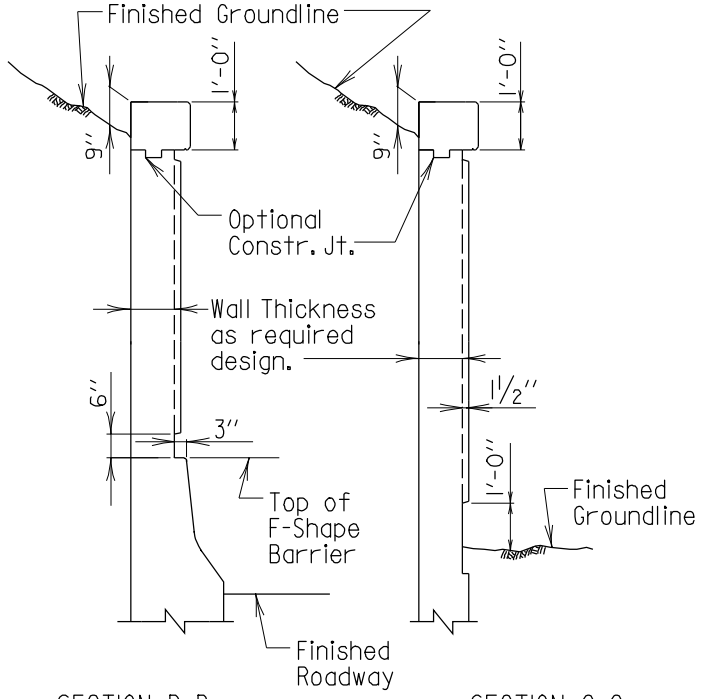
STANDARD NO. M(6.11)-86-181 SHEET 1 OF 2

MISCELLANEOUS



SECTION A-A

Scale: ¼" = 1'-0"



SECTION D-D

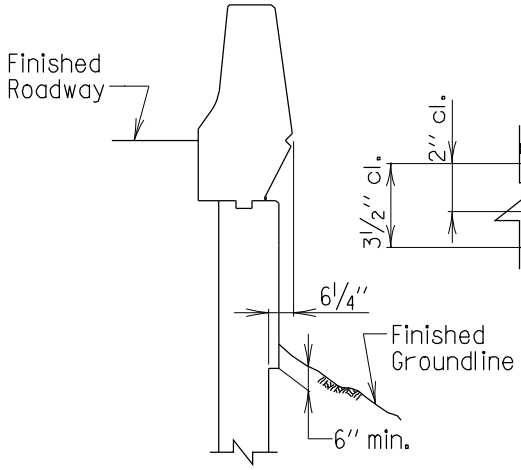
RETAINING WALL WITH JERSEY BARRIER

Scale: ¼" = 1'-0"

SECTION C-C

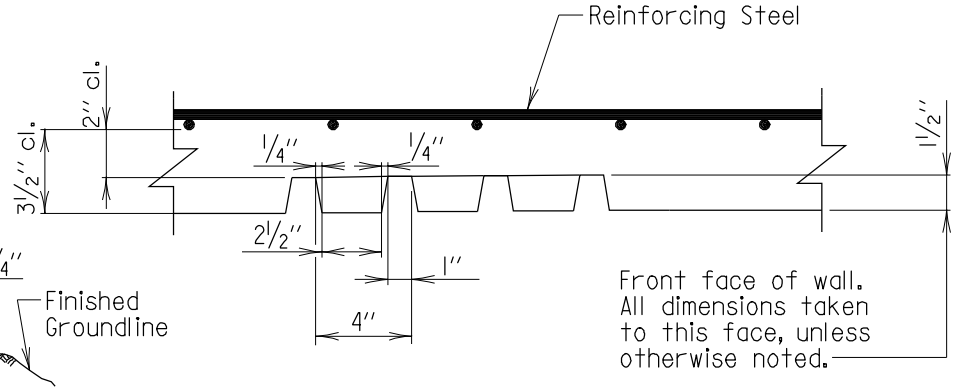
RETAINING WALL AT OTHER LOCATIONS

Scale: ¼" = 1'-0"



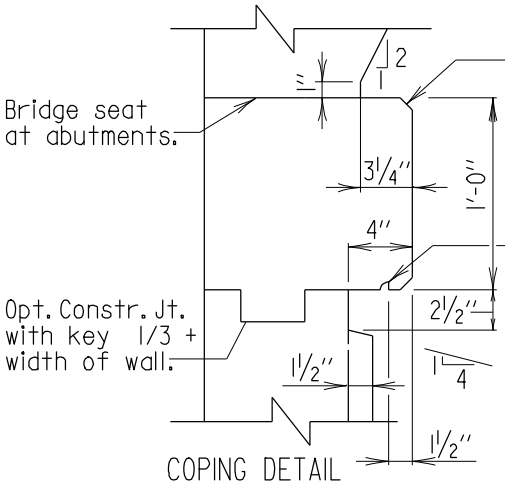
SECTION B-B

Scale: ¼" = 1'-0"



FORMBOARD PATTERN DETAIL

Scale: 1½" = 1'-0"



COPING DETAIL

Scale: 1" = 1'-0"

APPROVAL
E.S. Friedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 11/3/86

REVISIONS	
SHA	FHWA
3-9-89	6-8-90
1-22-01	·
10-22-03	·
·	·

FHWA APPROVAL
DATE: 6-8-90

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

TRAPEZOIDAL STRIATION DETAILS FOR BRIDGE SUBSTRUCTURE UNITS AND RETAINING WALLS

STANDARD NO. M(6.11)-86-181

SHEET 2 OF 2

MISCELLANEOUS

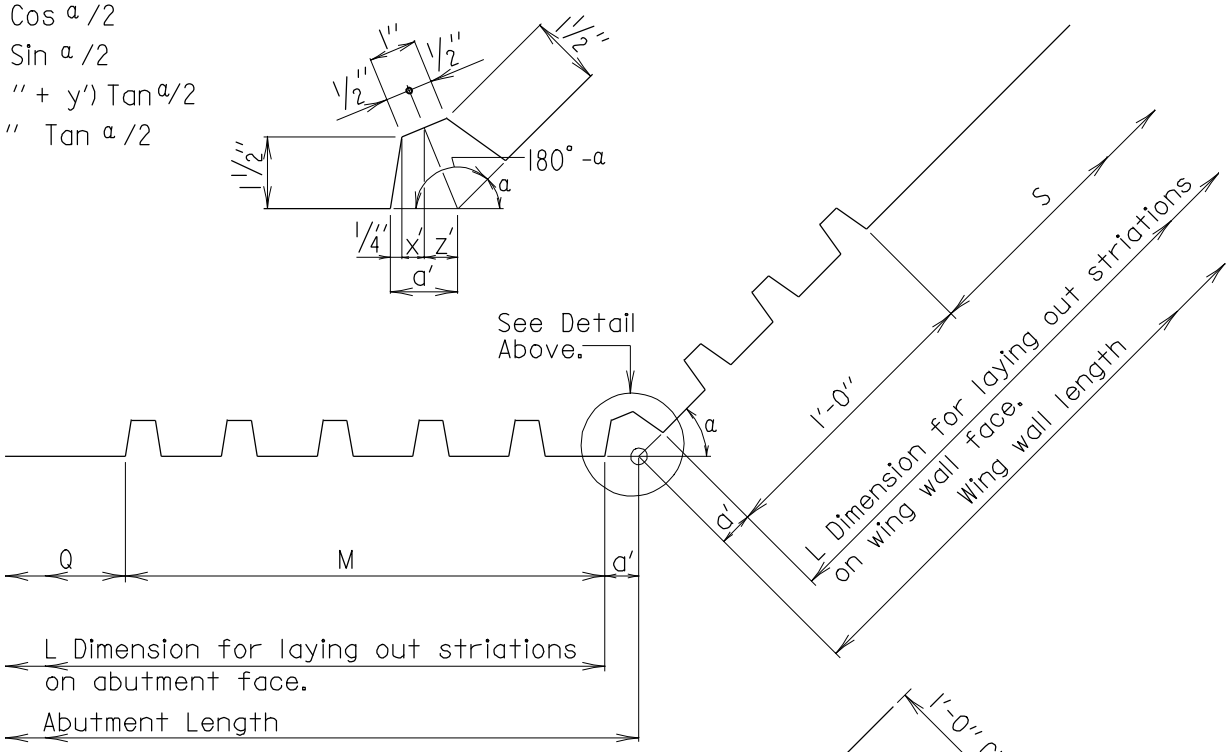
$a' = x' + z' + 1/4''$

$x' = 1/2'' \cos a/2$

$y' = 1/2'' \sin a/2$

$z' = (1\,1/2'' + y') \tan a/2$

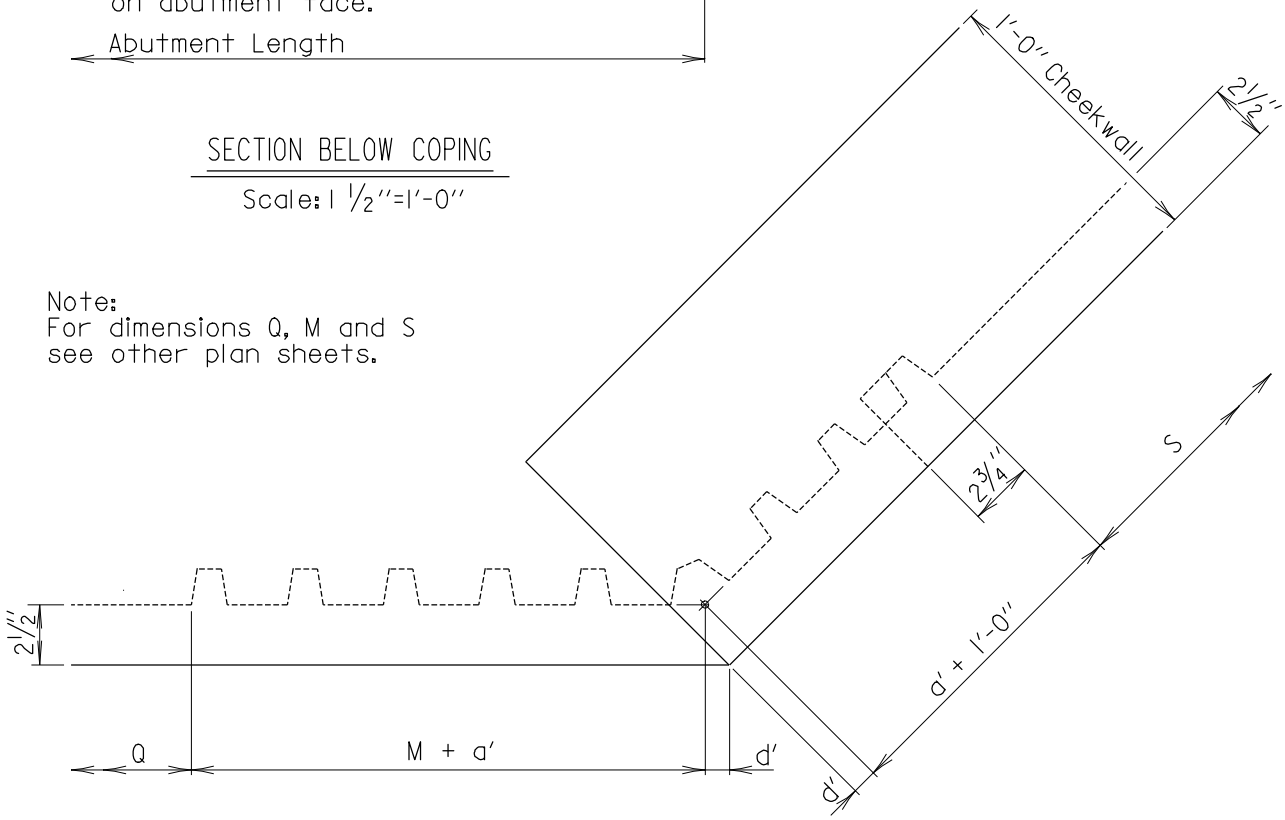
$d' = 2\,1/2'' \tan a/2$



SECTION BELOW COPING

Scale: 1 1/2''=1'-0''

Note:
For dimensions Q, M and S
see other plan sheets.



SECTION THRU COPING

Scale: 1 1/2''=1'-0''

Location				
a'				
d'				

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 11/3/86

REVISIONS	
SHA	FHWA
10-14-87	6-8-90
5-12-89	6-8-90
1-22-01	·
·	·

FHWA APPROVAL
DATE: 6-8-90

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

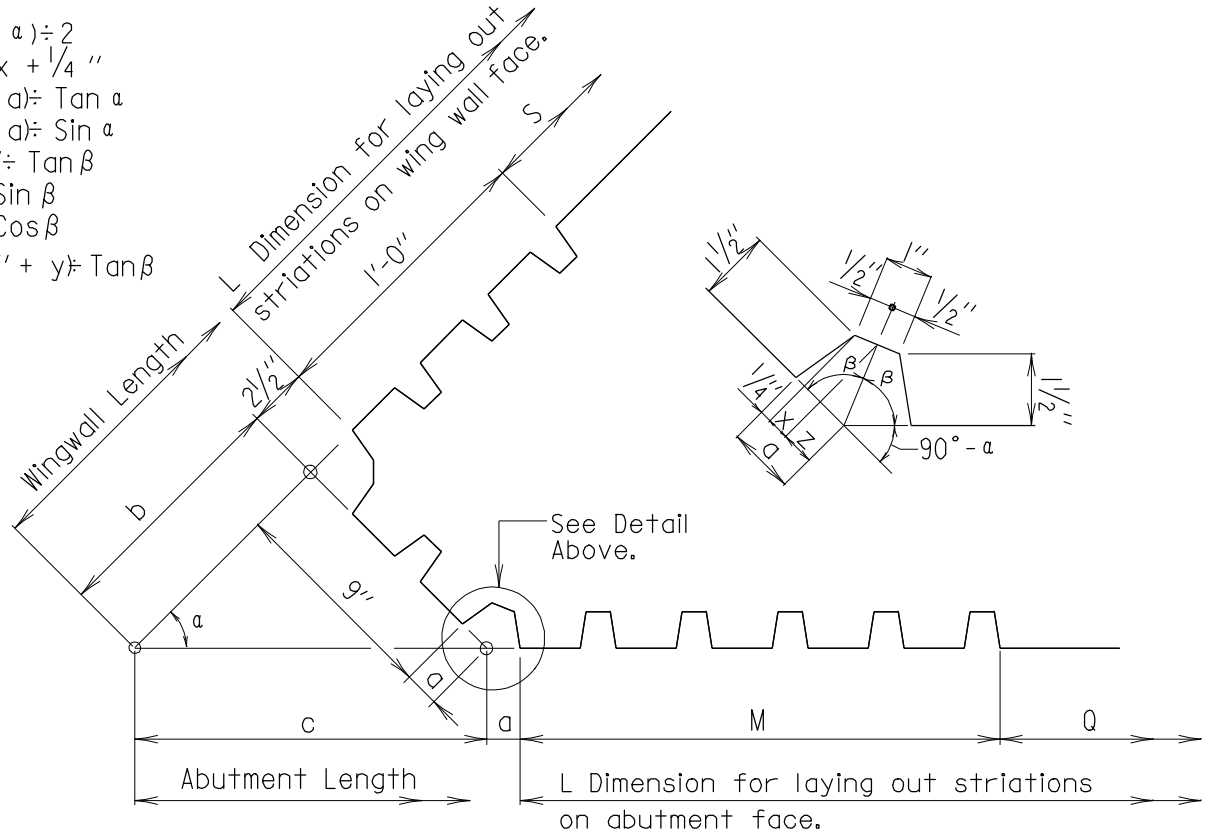
TRAPEZOIDAL STRIATION CORNER DETAILS SQUARE AND OBTUSE CORNER

STANDARD NO. M(6.12)-86-182

SHEET 1 OF 2

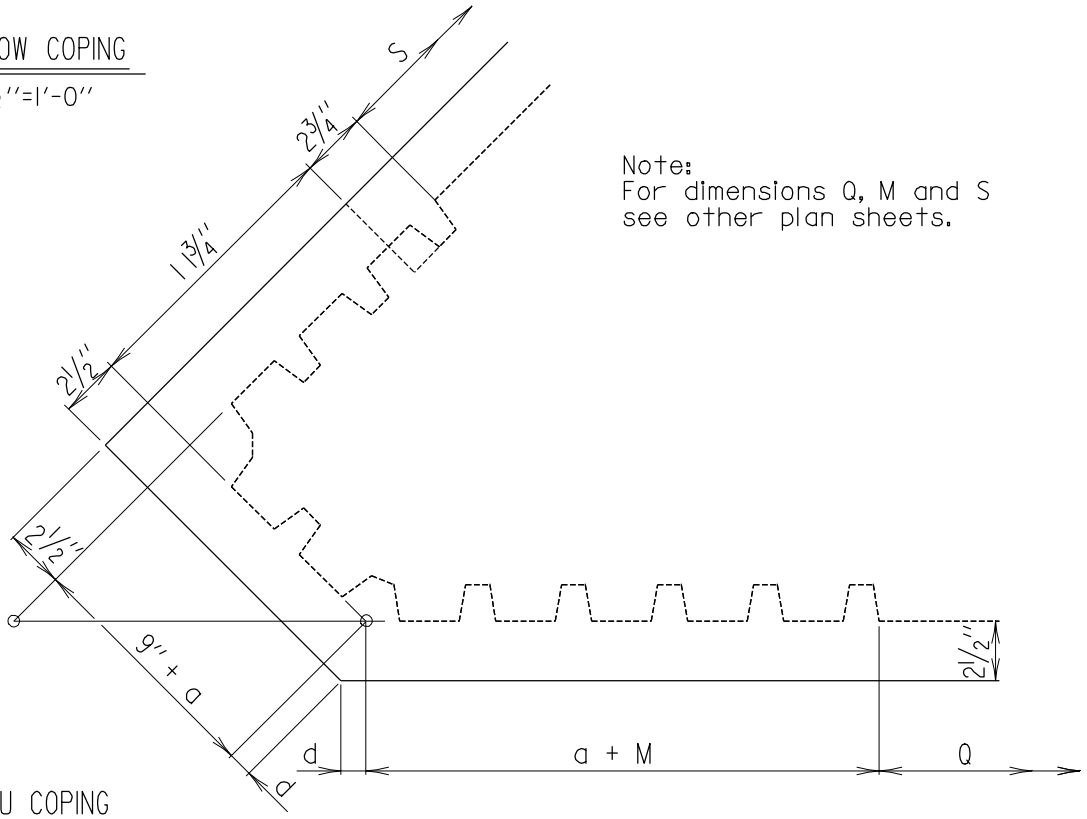
MISCELLANEOUS

$\beta = (90 + \alpha) \div 2$
$a = z + x + 1/4''$
$b = (9'' + a) \div \tan \alpha$
$c = (9'' + a) \div \sin \alpha$
$d = 2\,1/2'' \div \tan \beta$
$x = 1/2'' \sin \beta$
$y = 1/2'' \cos \beta$
$z = (1\,1/2'' + y) \div \tan \beta$



SECTION BELOW COPING

Scale: 1 1/2" = 1'-0"



Note:
For dimensions Q, M and S see other plan sheets.

SECTION THRU COPING

Scale: 1 1/2" = 1'-0"

Location				
a				
b				
c				
d				

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 11-3-86

REVISIONS	
SHA	FHWA
10-14-87	6-8-90
1-22-01	·
·	·
·	·

FHWA APPROVAL		
DATE: 6-8-90		

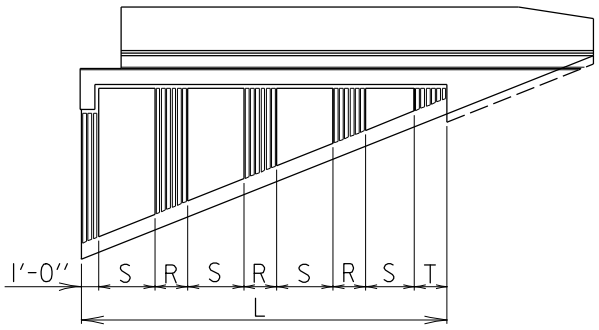
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

TRAPEZOIDAL STRIATION CORNER DETAILS
ACUTE CORNER

STANDARD NO. M(6.12)-86-182 SHEET 2 OF 2

MISCELLANEOUS

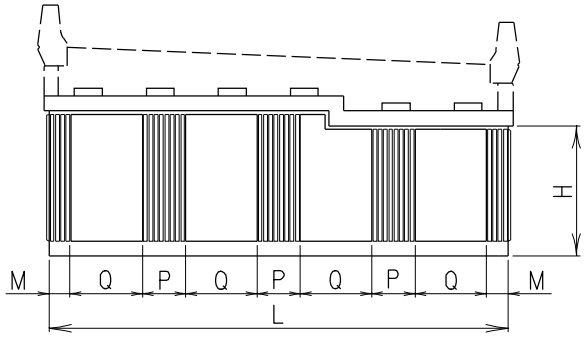
For wing walls
$S \approx \frac{4}{3} T \approx 2R$



S=1/N (L-1'-0"-T-(N-1)R)
N=Number of Plain Panels
R=Intermediate Striated Panel Dimension
T=End Striated Panel Dimension
S=Plain Panel Length
L=Adjusted Length of Abutment Face (See M(6.12)-86-182)

ABUTMENT
WING WALL
Scale:None

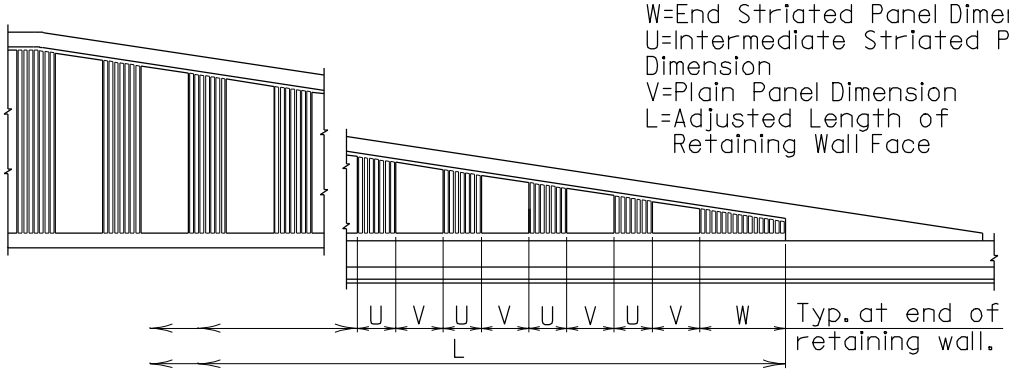
For abutments/piers
$Q \approx 2P \approx 4M$



Q=1/N (L-2M-(N-1)P)
N=Number of Plain Panels
M=End Striated Panel Dimension
P=Intermediate Striated Panel Dimension
Q=Plain Panel Dimension
L=Adjusted Length of Abutment Face (See M(6.12)-86-182)

ABUTMENT/PIER
Scale:None

For retaining walls
$W \approx \frac{5}{4} V \approx \frac{5}{3} U$



V=1/N (L-2W-(N-1)U)
N=Number of Plain Panels
W=End Striated Panel Dimension
U=Intermediate Striated Panel Dimension
V=Plain Panel Dimension
L=Adjusted Length of Retaining Wall Face

RETAINING WALL
Scale:None

FOR OFFICE USE ONLY

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 12/24/86

REVISIONS	
SHA	FHWA
12-21-87	·
10-22-03	·

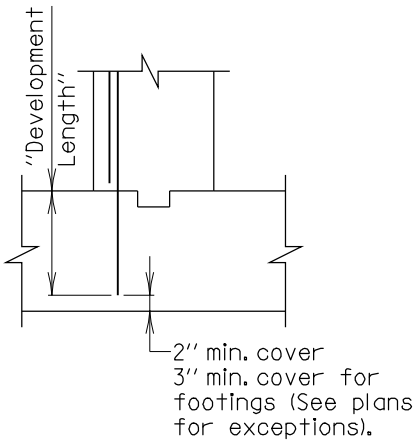
FHWA APPROVAL	·	·
DATE: ·	·	·

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

TRAPEZOIDAL STRIATION DETAILS FOR BRIDGE SUBSTRUCTURE UNITS AND RETAINING WALLS

STANDARD NO. M(6.13)-86-183 SHEET 1 OF 1

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-5"	1'-0"	1'-0"
#5	1'-9"	1'-3"	1'-0"
#6	2'-2"	1'-6"	1'-3"
#7	2'-1"	2'-1"	1'-8"
#8	3'-9"	2'-9"	2'-2"
#9	4'-9"	3'-5"	2'-9"
#10	6'-1"	4'-4"	3'-6"
#11	7'-5"	5'-4"	4'-3"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."
4. If depth of member does not allow bar development length indicated in Categories A, B, and C: then hook shall be added to all bars not conforming, as per D, E, and F per Std. No. M(6.08)-86-178.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
1-22-01	·
9-20-05	·
12-4-07	·
·	·

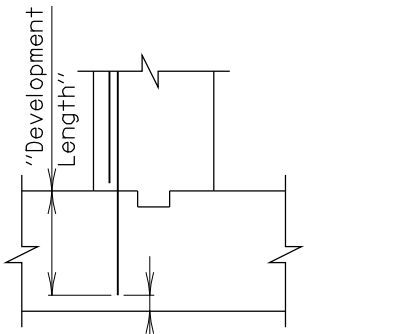
FHWA APPROVAL
DATE:

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.3 (3500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.14)-90-214 SHEET 1 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter = c/c Spacing	
	A	B	C			
#4	1'-9"	1'-6"	1'-3"	1 1/2"	3"	3 1/2"
#5	2'-2"	1'-11"	1'-6"	1 7/8"	3 3/4"	4 3/8"
#6	2'-7"	2'-3"	1'-10"	2 1/4"	4 1/2"	5 1/4"
#7	3'-6"	3'-1"	2'-6"	2 5/8"	5 1/4"	6 1/8"
#8	4'-7"	4'-1"	3'-3"	3"	6"	7"
#9	5'-9"	5'-1"	4'-1"	3 3/8"	6 3/4"	7 7/8"
#10	7'-4"	6'-6"	5'-2"	3 3/4"	7 5/8"	8 7/8"
#11	9'-0"	7'-11"	6'-4"	4 1/4"	8 1/2"	9 7/8"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

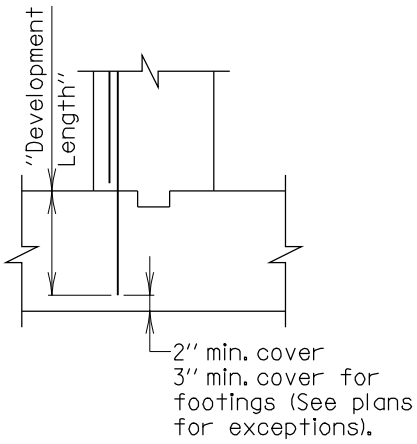
FHWA APPROVAL
DATE: .

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.3 (3500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.1

STANDARD NO. M(6.14)-90-214 SHEET 2 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-9"	1'-3"	1'-0"
#5	2'-2"	1'-6"	1'-3"
#6	2'-7"	1'-10"	1'-6"
#7	3'-5"	Does Not Exist	2'-0"
#8	4'-6"		2'-7"
#9	5'-7"		3'-3"
#10	7'-2"		4'-1"
#11	8'-10"		5'-1"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

Note:

1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

CASE NO.2 - For bars coated with epoxy not in Case No. 1.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

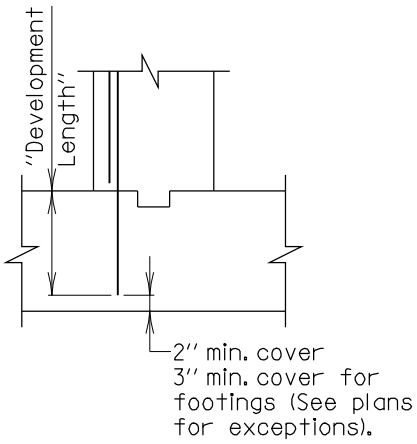
FHWA APPROVAL
DATE: .

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.3 (3500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.2

STANDARD NO. M(6.14)-90-214 SHEET 3 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-5"	1'-0"	1'-0"
#5	1'-9"	1'-3"	1'-0"
#6	2'-2"	1'-6"	1'-3"
#7	2'-11"	2'-1"	1'-8"
#8	3'-9"	2'-9"	2'-2"
#9	4'-9"	3'-5"	2'-9"
#10	6'-1"	4'-4"	3'-6"
#11	7'-5"	5'-4"	4'-3"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."
4. If depth of member does not allow bar development length indicated in Categories A, B, and C: then hook shall be added to all bars not conforming, as per D, E, and F per Std. No. M(6.08)-86-178.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: .

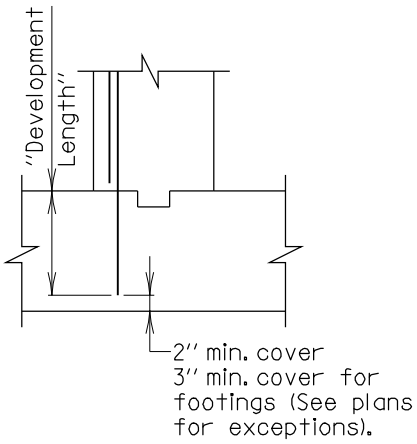
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.3 (3500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.14)-90-214(L) SHEET 1 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter = c/c Spacing	
	A	B	C			
#4	1'-9"	1'-6"	1'-3"	1 1/2"	3"	3 1/2"
#5	2'-2"	1'-11"	1'-6"	1 7/8"	3 3/4"	4 3/8"
#6	2'-7"	2'-3"	1'-10"	2 1/4"	4 1/2"	5 1/4"
#7	3'-6"	3'-1"	2'-6"	2 5/8"	5 1/4"	6 1/8"
#8	4'-7"	4'-1"	3'-3"	3"	6"	7"
#9	5'-9"	5'-1"	4'-1"	3 3/8"	6 3/4"	7 7/8"
#10	7'-4"	6'-6"	5'-2"	3 3/4"	7 5/8"	8 7/8"
#11	9'-0"	7'-11"	6'-4"	4 1/4"	8 1/2"	9 7/8"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: .

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

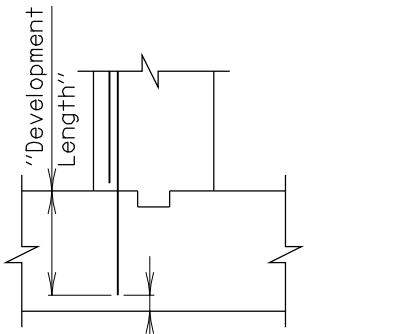
VERIFIED 11-26-2007 LRFD

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.3 (3500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.1

STANDARD NO. M(6.14)-90-214(L)

SHEET 2 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-9"	1'-3"	1'-0"
#5	2'-2"	1'-6"	1'-3"
#6	2'-7"	1'-10"	1'-6"
#7	3'-5"	Does Not Exist	2'-0"
#8	4'-6"		2'-7"
#9	5'-7"		3'-3"
#10	7'-2"		4'-1"
#11	8'-10"		5'-1"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."

CASE NO.2 - For bars coated with epoxy not in Case No. 1.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: .

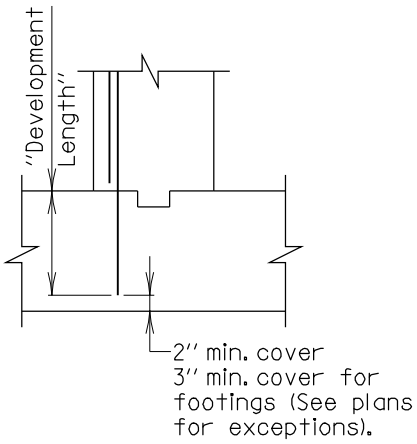
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.3 (3500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.2

STANDARD NO. M(6.14)-90-214(L) SHEET 3 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-11"	1'-4"	1'-1"
#5	2'-4"	1'-8"	1'-4"
#6	2'-10"	2'-0"	1'-8"
#7	3'-4"	2'-5"	1'-11"
#8	4'-5"	3'-2"	2'-7"
#9	5'-7"	4'-0"	3'-3"
#10	7'-1"	5'-1"	4'-1"
#11	8'-8"	6'-3"	5'-0"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths only apply to 4500 P.S.I. lightweight concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."
4. If depth of member does not allow bar development length indicated in Categories A, B, and C: then hook shall be added to all bars not conforming, as per D, E, and F per Std. No. M(6.09)-86-179.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

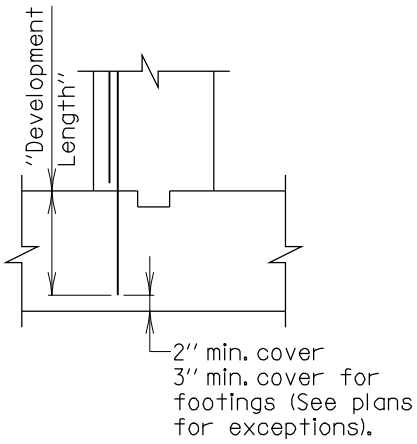
FHWA APPROVAL
DATE: .

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.15)-90-215 SHEET 1 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter = c/c Spacing	
	A	B	C			
#4	2'-4"	2'-0"	1'-8"	1 1/2"	3"	3 1/2"
#5	2'-10"	2'-6"	2'-0"	1 7/8"	3 3/4"	4 3/8"
#6	3'-5"	3'-0"	2'-5"	2 1/4"	4 1/2"	5 1/4"
#7	4'-1"	3'-7"	2'-11"	2 5/8"	5 1/4"	6 1/8"
#8	5'-4"	4'-9"	3'-10"	3"	6"	7"
#9	6'-9"	6'-0"	4'-10"	3 3/8"	6 3/4"	7 7/8"
#10	8'-7"	7'-7"	6'-1"	3 3/4"	7 5/8"	8 7/8"
#11	10'-7"	9'-4"	7'-6"	4 1/4"	8 1/2"	9 7/8"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths only apply to 4500 P.S.I. lightweight concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

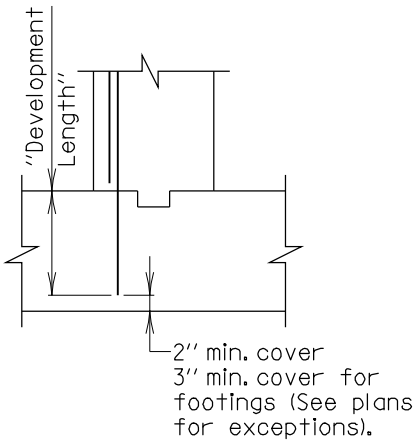
FHWA APPROVAL
DATE: .

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.1

STANDARD NO. M(6.15)-90-215 SHEET 2 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-3"	1'-7"	1'-3"
#5	2'-9"	2'-0"	1'-7"
#6	3'-4"	2'-5"	1'-11"
#7	3'-11"	Does Not Exist	2'-3"
#8	5'-2"		2'-11"
#9	6'-6"		3'-9"
#10	8'-3"		4'-9"
#11	10'-1"		5'-9"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

CASE NO.2 - For bars coated with epoxy not in Case No.1.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths only apply to 4500 P.S.I. lightweight concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

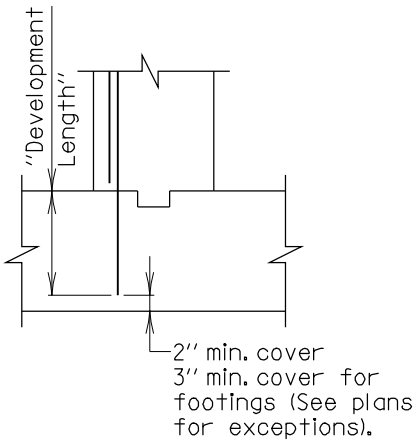
FHWA APPROVAL
DATE: .

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.2

STANDARD NO. M(6.15)-90-215 SHEET 3 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-11"	1'-4"	1'-1"
#5	2'-4"	1'-8"	1'-4"
#6	2'-10"	2'-0"	1'-8"
#7	3'-4"	2'-5"	1'-11"
#8	4'-5"	3'-2"	2'-7"
#9	5'-7"	4'-0"	3'-3"
#10	7'-1"	5'-1"	4'-1"
#11	8'-8"	6'-3"	5'-0"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths only apply to 4500 P.S.I. lightweight concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."
4. If depth of member does not allow bar development length indicated in Categories A, B, and C: then hook shall be added to all bars not conforming, as per D, E, and F per Std. No. M(6.09)-86-179.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: .

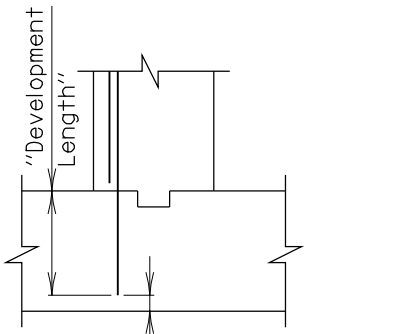
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.15)-90-215(L) SHEET 1 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter = c/c Spacing	
	A	B	C			
#4	2'-4"	2'-0"	1'-8"	1 1/2"	3"	3 1/2"
#5	2'-10"	2'-6"	2'-0"	1 7/8"	3 3/4"	4 3/8"
#6	3'-5"	3'-0"	2'-5"	2 1/4"	4 1/2"	5 1/4"
#7	4'-1"	3'-7"	2'-11"	2 5/8"	5 1/4"	6 1/8"
#8	5'-4"	4'-9"	3'-10"	3"	6"	7"
#9	6'-9"	6'-0"	4'-10"	3 3/8"	6 3/4"	7 7/8"
#10	8'-7"	7'-7"	6'-1"	3 3/4"	7 5/8"	8 7/8"
#11	10'-7"	9'-4"	7'-6"	4 1/4"	8 1/2"	9 7/8"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths only apply to 4500 P.S.I. lightweight concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: .

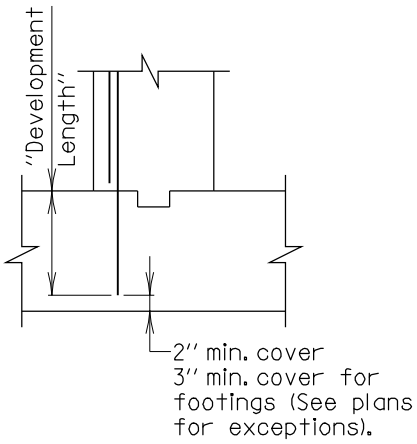
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.1

STANDARD NO. M(6.15)-90-215(L)

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-3"	1'-7"	1'-3"
#5	2'-9"	2'-0"	1'-7"
#6	3'-4"	2'-5"	1'-11"
#7	3'-11"	Does Not Exist	2'-3"
#8	5'-2"		2'-11"
#9	6'-6"		3'-9"
#10	8'-3"		4'-9"
#11	10'-1"		5'-9"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

CASE NO.2 - For bars coated with epoxy not in Case No.1.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths only apply to 4500 P.S.I. lightweight concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: .

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

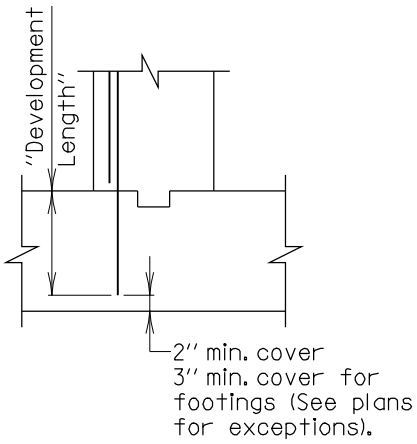
VERIFIED 11-26-2007 LRFD

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.2

STANDARD NO. M(6.15)-90-215(L)

SHEET 3 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-5"	1'-0"	1'-0"
#5	1'-9"	1'-3"	1'-0"
#6	2'-2"	1'-6"	1'-3"
#7	2'-7"	1'-10"	1'-6"
#8	3'-4"	2'-5"	1'-11"
#9	4'-3"	3'-0"	2'-5"
#10	5'-4"	3'-10"	3'-1"
#11	6'-7"	4'-8"	3'-9"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."
4. If depth of member does not allow bar development length indicated in Categories A, B, and C; then hook shall be added to all bars not conforming, as per D, E, and F per Std. No. M(6.10)-86-180.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
1-22-01	·
9-20-05	·
12-4-07	·
·	·

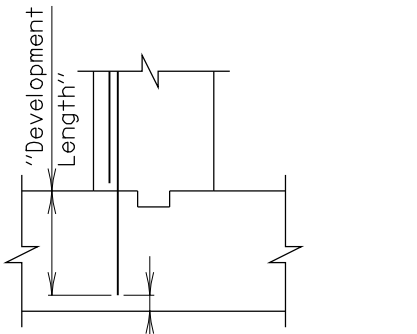
FHWA APPROVAL
DATE:

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.6 (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.16)-90-216 SHEET 1 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter = c/c Spacing	
	A	B	C			
#4	1'-9"	1'-6"	1'-3"	1 1/2"	3"	3 1/2"
#5	2'-2"	1'-11"	1'-6"	1 7/8"	3 3/4"	4 3/8"
#6	2'-7"	2'-3"	1'-10"	2 1/4"	4 1/2"	5 1/4"
#7	3'-1"	2'-9"	2'-2"	2 5/8"	5 1/4"	6 1/8"
#8	4'-1"	3'-7"	2'-10"	3"	6"	7"
#9	5'-1"	4'-6"	3'-7"	3 3/8"	6 3/4"	7 7/8"
#10	6'-6"	5'-9"	4'-7"	3 3/4"	7 5/8"	8 7/8"
#11	7'-11"	7'-0"	5'-7"	4 1/4"	8 1/2"	9 7/8"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

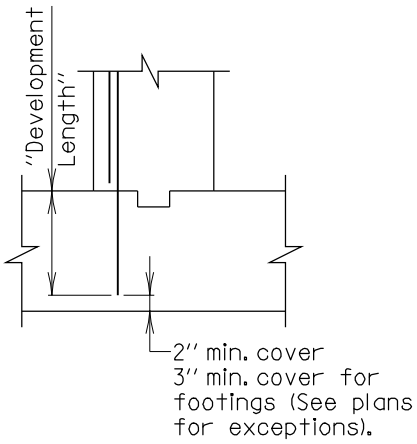
FHWA APPROVAL
DATE:

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.6 (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.1

STANDARD NO. M(6.16)-90-216 SHEET 2 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-9"	1'-3"	1'-0"
#5	2'-2"	1'-6"	1'-3"
#6	2'-7"	1'-10"	1'-6"
#7	3'-0"	Does Not Exist	1'-9"
#8	3'-11"		2'-3"
#9	5'-0"		2'-10"
#10	6'-4"		3'-8"
#11	7'-9"		4'-5"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

CASE NO.2 - For bars coated with epoxy not in Case No. 1.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
12-4-07	·

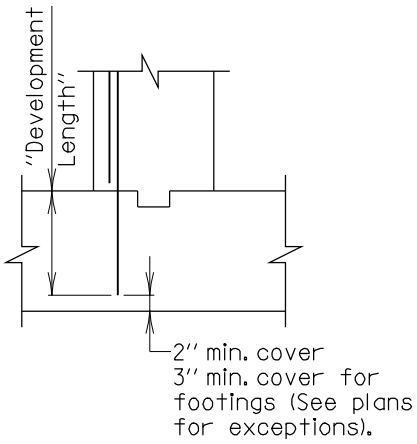
FHWA APPROVAL
DATE: .

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.6 (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.2

STANDARD NO. M(6.16)-90-216 SHEET 3 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-5"	1'-0"	1'-0"
#5	1'-9"	1'-3"	1'-0"
#6	2'-2"	1'-6"	1'-3"
#7	2'-7"	1'-10"	1'-6"
#8	3'-4"	2'-5"	1'-11"
#9	4'-3"	3'-0"	2'-5"
#10	5'-4"	3'-10"	3'-1"
#11	6'-7"	4'-8"	3'-9"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."
4. If depth of member does not allow bar development length indicated in Categories A, B, and C; then hook shall be added to all bars not conforming, as per D, E, and F per Std. No. M(6.10)-86-180.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: .

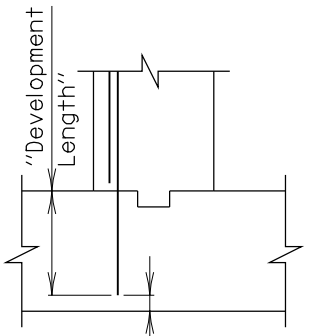
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.6 (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.16)-90-216(L) SHEET 1 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter = c/c Spacing	
	A	B	C			
#4	1'-9"	1'-6"	1'-3"	1 1/2"	3"	3 1/2"
#5	2'-2"	1'-11"	1'-6"	1 7/8"	3 3/4"	4 3/8"
#6	2'-7"	2'-3"	1'-10"	2 1/4"	4 1/2"	5 1/4"
#7	3'-1"	2'-9"	2'-2"	2 5/8"	5 1/4"	6 1/8"
#8	4'-1"	3'-7"	2'-10"	3"	6"	7"
#9	5'-1"	4'-6"	3'-7"	3 3/8"	6 3/4"	7 7/8"
#10	6'-6"	5'-9"	4'-7"	3 3/4"	7 5/8"	8 7/8"
#11	7'-11"	7'-0"	5'-7"	4 1/4"	8 1/2"	9 7/8"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: .

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

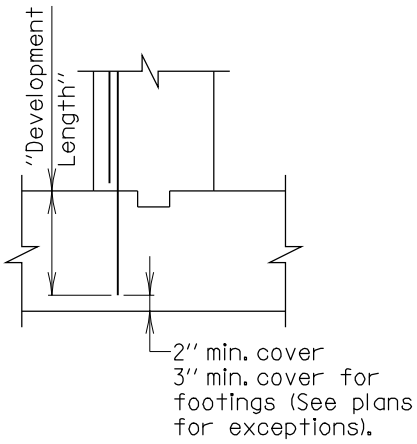
VERIFIED 11-26-2007 LRFD

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.6 (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.1

STANDARD NO. M(6.16)-90-216(L)

SHEET 2 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-9"	1'-3"	1'-0"
#5	2'-2"	1'-6"	1'-3"
#6	2'-7"	1'-10"	1'-6"
#7	3'-0"	Does Not Exist	1'-9"
#8	3'-11"		2'-3"
#9	5'-0"		2'-10"
#10	6'-4"		3'-8"
#11	7'-9"		4'-5"

* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
B- All bars not in Category A spaced less than 6" apart.
C- All bars not in Category A spaced 6" or more apart.

CASE NO.2 - For bars coated with epoxy not in Case No. 1.

Note:
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 2/2/90

REVISIONS	
SHA	FHWA
11-23-93	·
1-22-01	·
9-20-05	·
11-26-07	·

FHWA APPROVAL
DATE: .

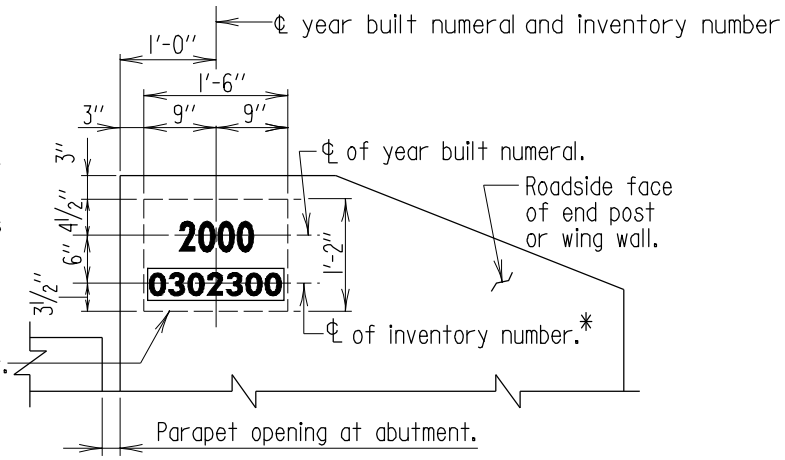
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

VERIFIED 11-26-2007 LRFD

DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.6 (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.2

STANDARD NO. M(6.16)-90-216(L) SHEET 3 OF 3

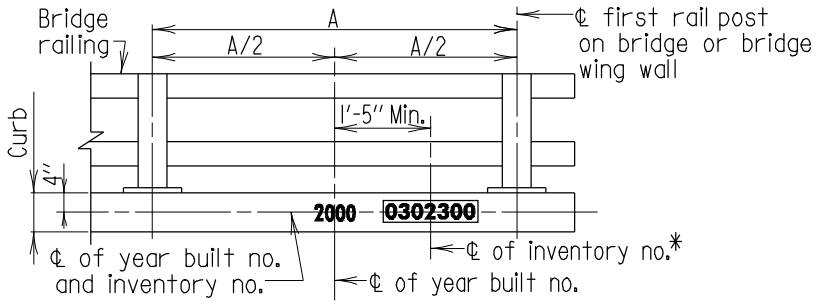
MISCELLANEOUS



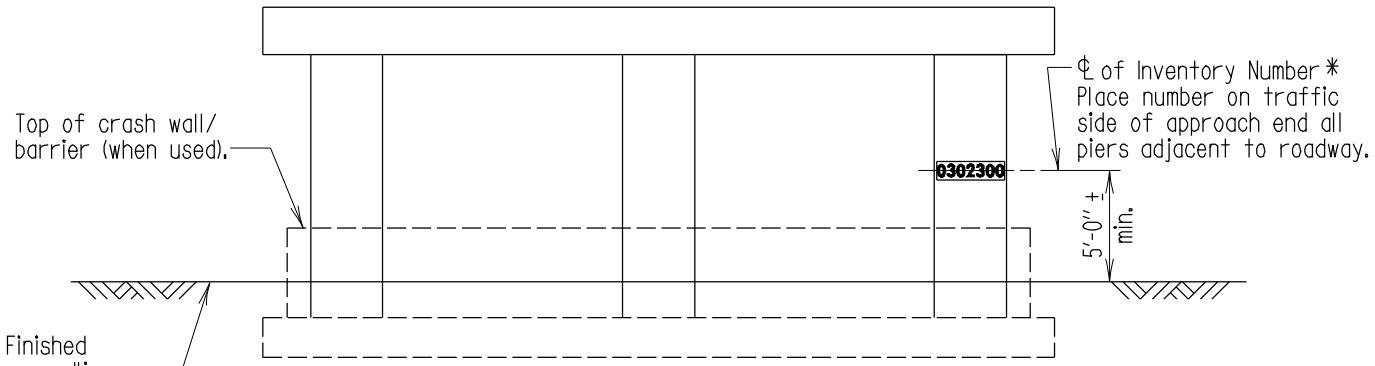
If end post has a form liner finish, place year built and structure inventory numbers in curb area as shown for bridges with railing and no parapets. ℄ of year built to be located 1'-0" from parapet opening at abutment.

BRIDGES WITH PARAPET

Location: Dual Bridges-Each Approach End (Outside Shoulder).
Single Bridge - Approach End - North or East corner.
Where bridge has a concrete parapet and no definitive end post, place year built marking and structure inventory number on face of parapet as close to center line of bearing at abutment as practical.



BRIDGES WITH RAILING AND NO PARAPETS



PIER COLUMN

ONLY ON ROAD OVER ROAD BRIDGES

* Black numbers 3" high on a painted white background, (5" x 17").

Notes:
1. For existing structures, where a year built is shown on the structure and structure is to be rehabilitated, the marking should read 1942-2000 (old year first - new year).
2. For existing structures with no year built contact the Office of Bridge Development for old year.
3. For Year Built Numerals refer to Standard No. M(0.07)-99-334.

APPROVAL
C.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 9/14/99

REVISIONS	
SHA	FHWA
3-10-00	·
12-7-00	·
1-22-01	·
·	·

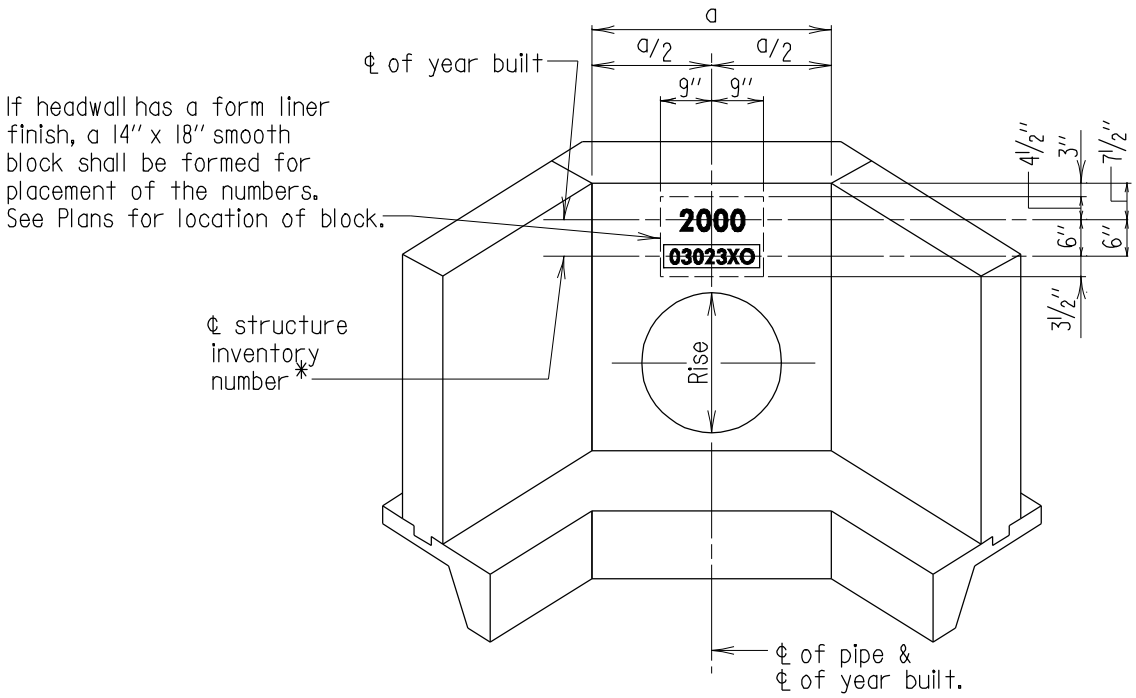
FHWA APPROVAL	
DATE: .	

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

LOCATION OF YEAR BUILT MARKING AND STRUCTURE INVENTORY NUMBER ON BRIDGES

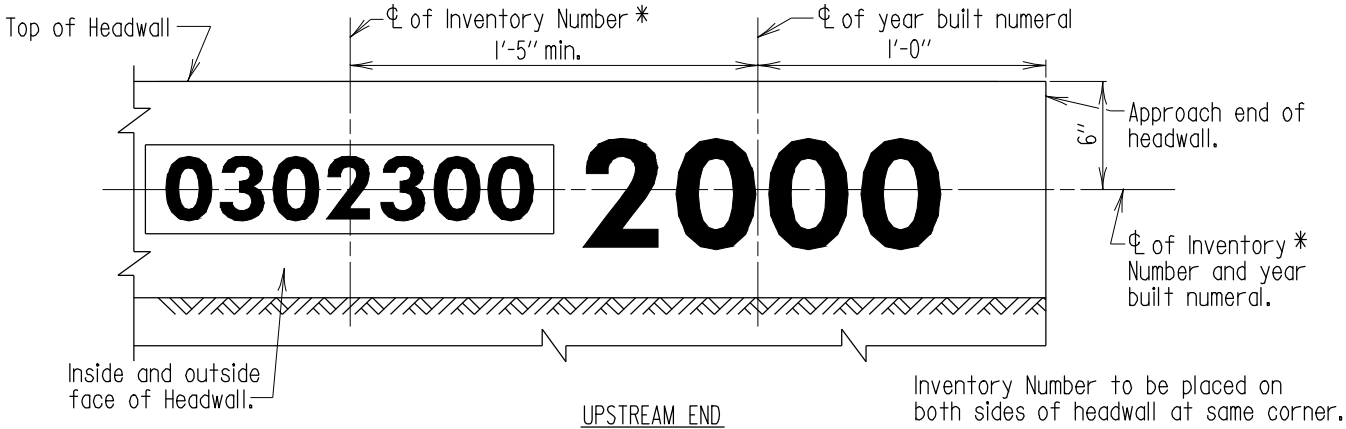
STANDARD NO. M(0.04)-99-331 SHEET 1 OF 1

MISCELLANEOUS



UPSTREAM END

HEADWALLS FOR PIPES AND/OR PIPE ARCHES WITH RISE 3'-0" OR GREATER



UPSTREAM END

BOX CULVERTS

* Black numbers 3" high on a painted white background, (5" x 17").

Notes:
1. For existing structures, where a year built is shown on the structure and structure is to be rehabilitated, the marking should read 1942-2000 (old year first - new year).
2. For existing structures with no year built contact Office of Bridge Development for old year.
3. For Year Built Numerals refer to Standard No. M(0.07)-99-334.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 9/14/99

REVISIONS	
SHA	FHWA
3-10-00	·
1-22-01	·
·	·
·	·

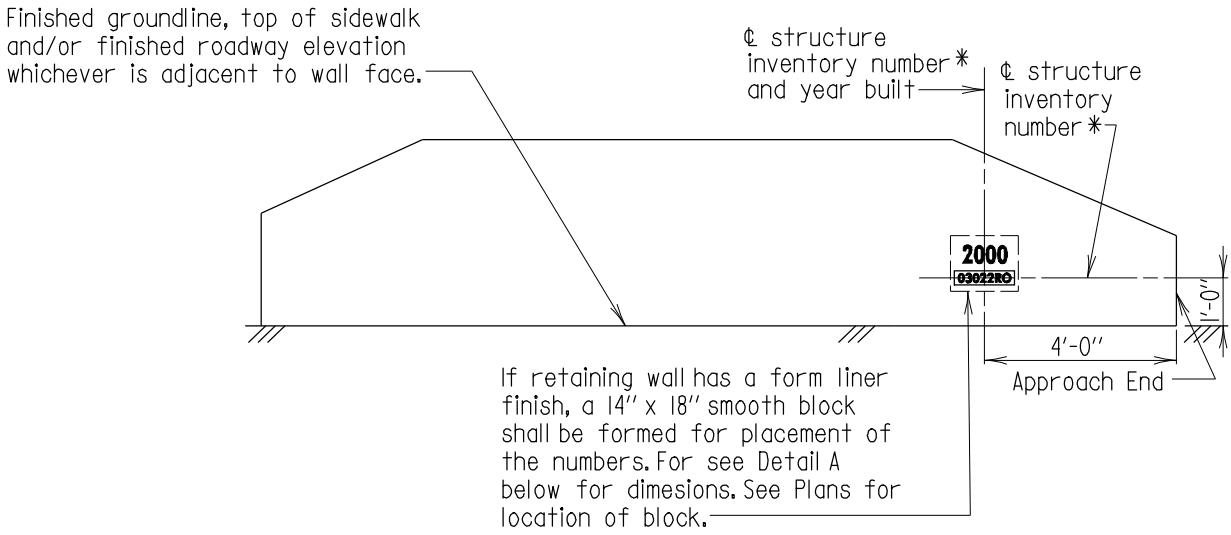
FHWA APPROVAL	
DATE: .	

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

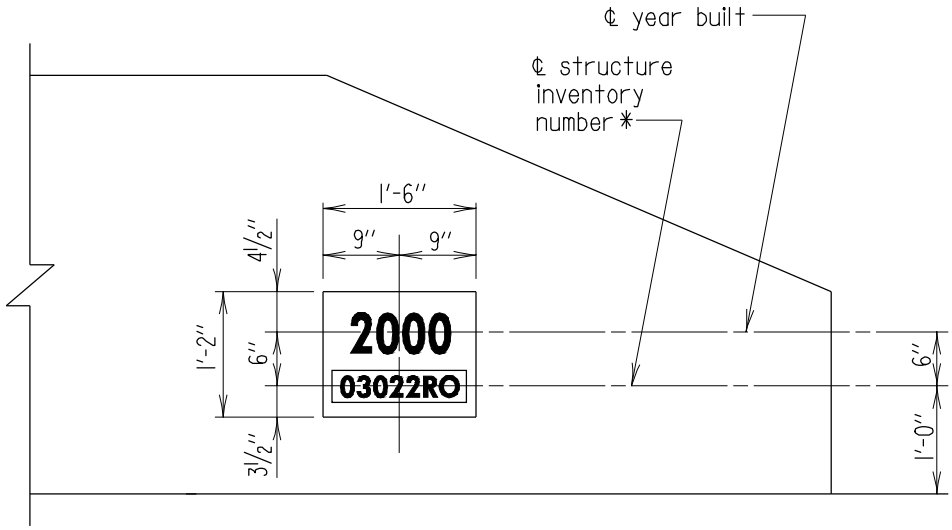
LOCATION OF YEAR BUILT MARKING AND STRUCTURE INVENTORY NUMBER ON HEADWALLS FOR PIPES AND BOX CULVERTS

STANDARD NO. M(0.05)-99-332 SHEET 1 OF 1

MISCELLANEOUS



RETAINING WALLS



DETAIL A

Notes:
1. For existing structures, where a year built is shown on the structure and structure is to be rehabilitated, the marking should read 1942-2000 (old year first - new year).
2. For existing structures with no year built contact the Office of Bridge Development for old year.
3. For Year Built Numerals refer to Standard No. M(0.07)-99-334.
4. For retaining walls that are not visible from the approach roadway, refer to BR-MAINT(0.02)-00-339.

* Black numbers 3" high on a painted white background, (5" x 17").

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 9/14/99

REVISIONS	
SHA	FHWA
3-10-00	·
1-22-01	·
9-20-05	·
·	·

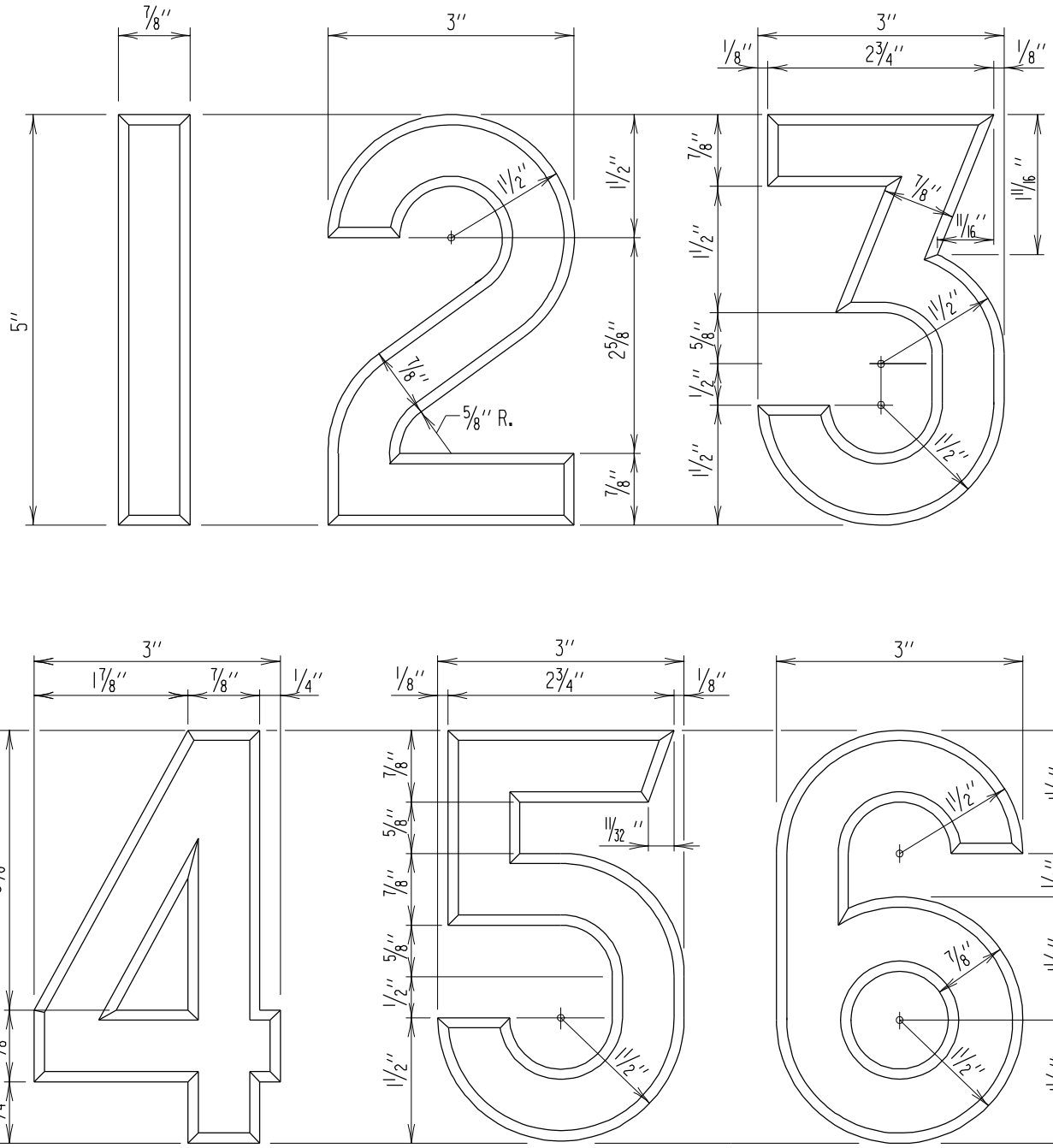
FHWA APPROVAL
DATE: .

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

LOCATION OF YEAR BUILT MARKING AND STRUCTURE INVENTORY NUMBER ON RETAINING WALLS

STANDARD NO. M(0.06)-99-333 SHEET 1 OF 1

MISCELLANEOUS



Note:
Year built numerals to be indented into concrete (unpainted) - as indicated on Standard Nos. M(0.04)-99-331, M(0.05)-99-332 and M(0.06)-99-333.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 9/14/99

REVISIONS	
SHA	FHWA
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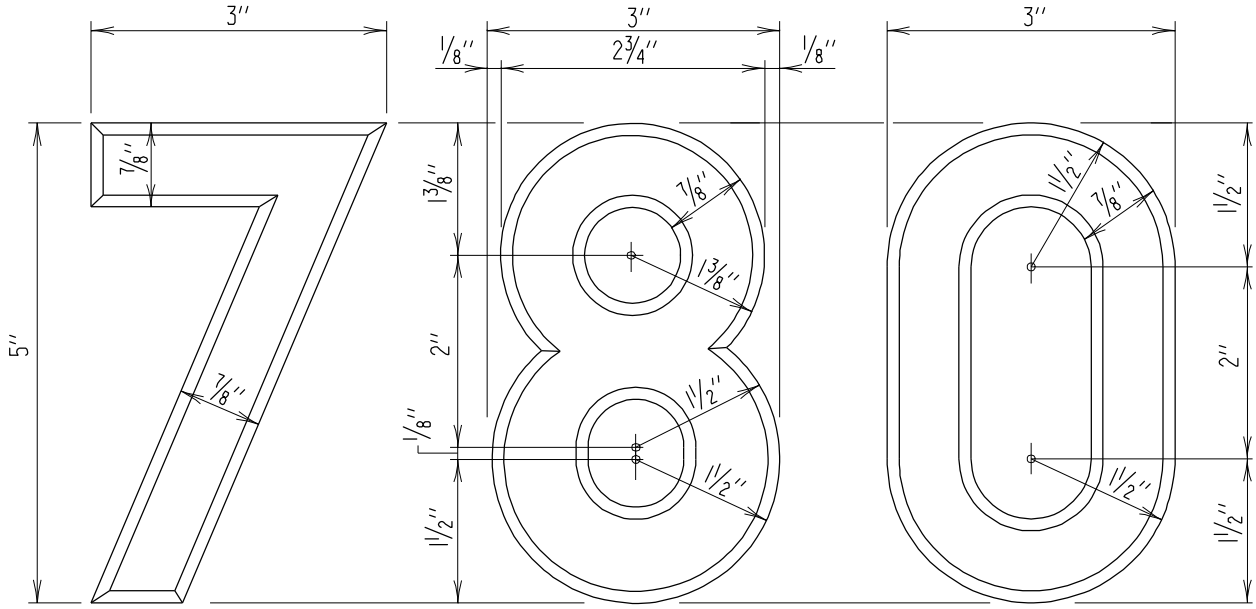
FHWA APPROVAL
DATE: .

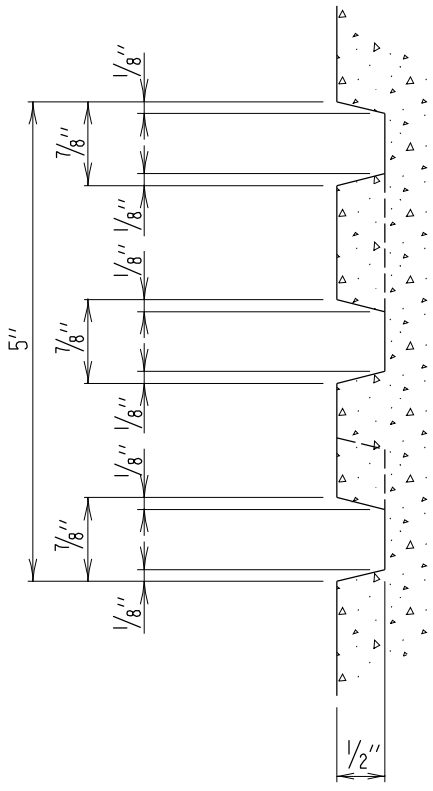
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

NUMERALS FOR YEAR BUILT MARKING ON STRUCTURES

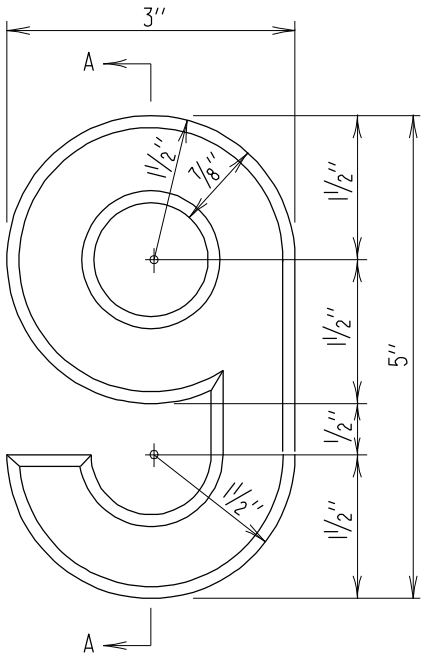
STANDARD NO. M(0.07)-99-334 SHEET 1 OF 2

MISCELLANEOUS





SECTION A-A



APPROVAL
E.S. Friedman DIRECTOR OFFICE OF BRIDGE DEVEL.
DATE: 9/14/99

REVISIONS	
SHA	FHWA
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FHWA APPROVAL
DATE: .

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF BRIDGE DEVELOPMENT

NUMERALS FOR YEAR BUILT MARKING ON STRUCTURES

STANDARD NO. M(0.07)-99-334

SHEET 2 OF 2

MISCELLANEOUS